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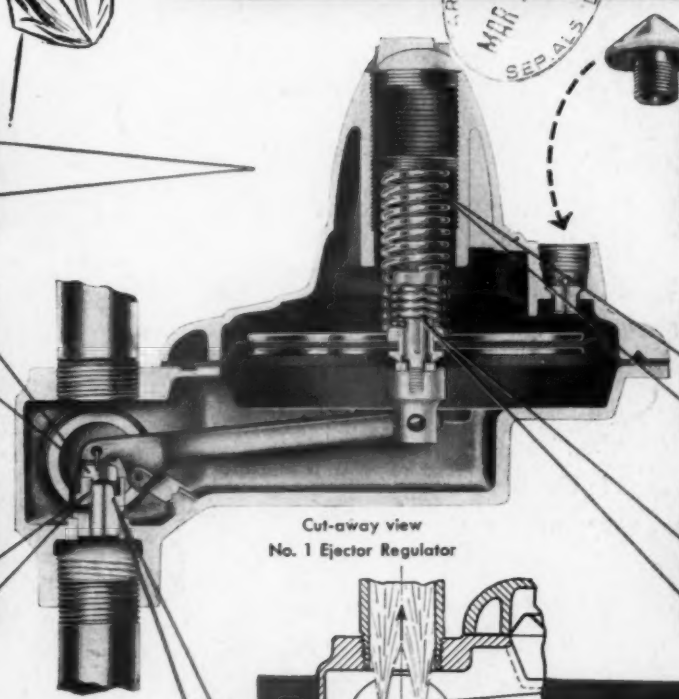

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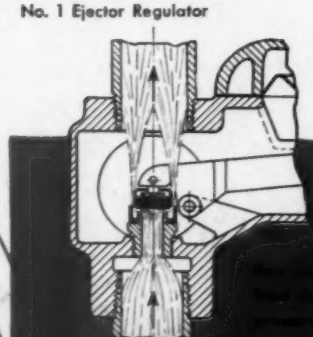

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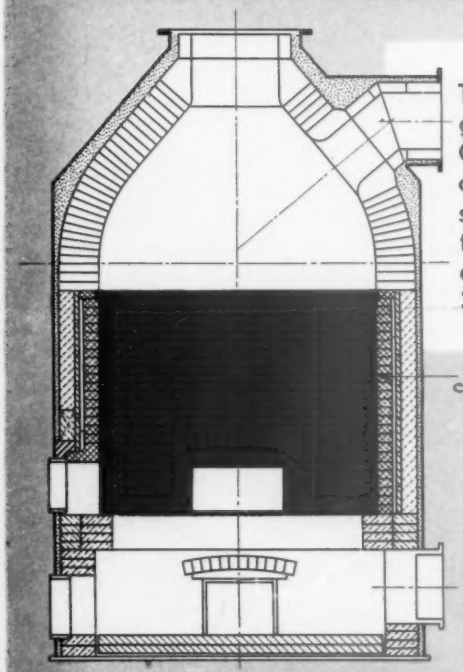

Sectional drawing of gas generator lined with CRYSTOLON refractory shapes.

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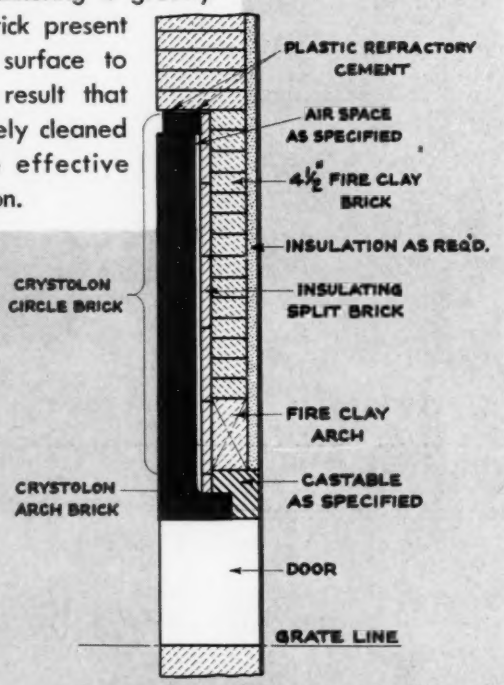

Cross-section of gas generator wall showing details of refractories including CRYSTOLON interlining.

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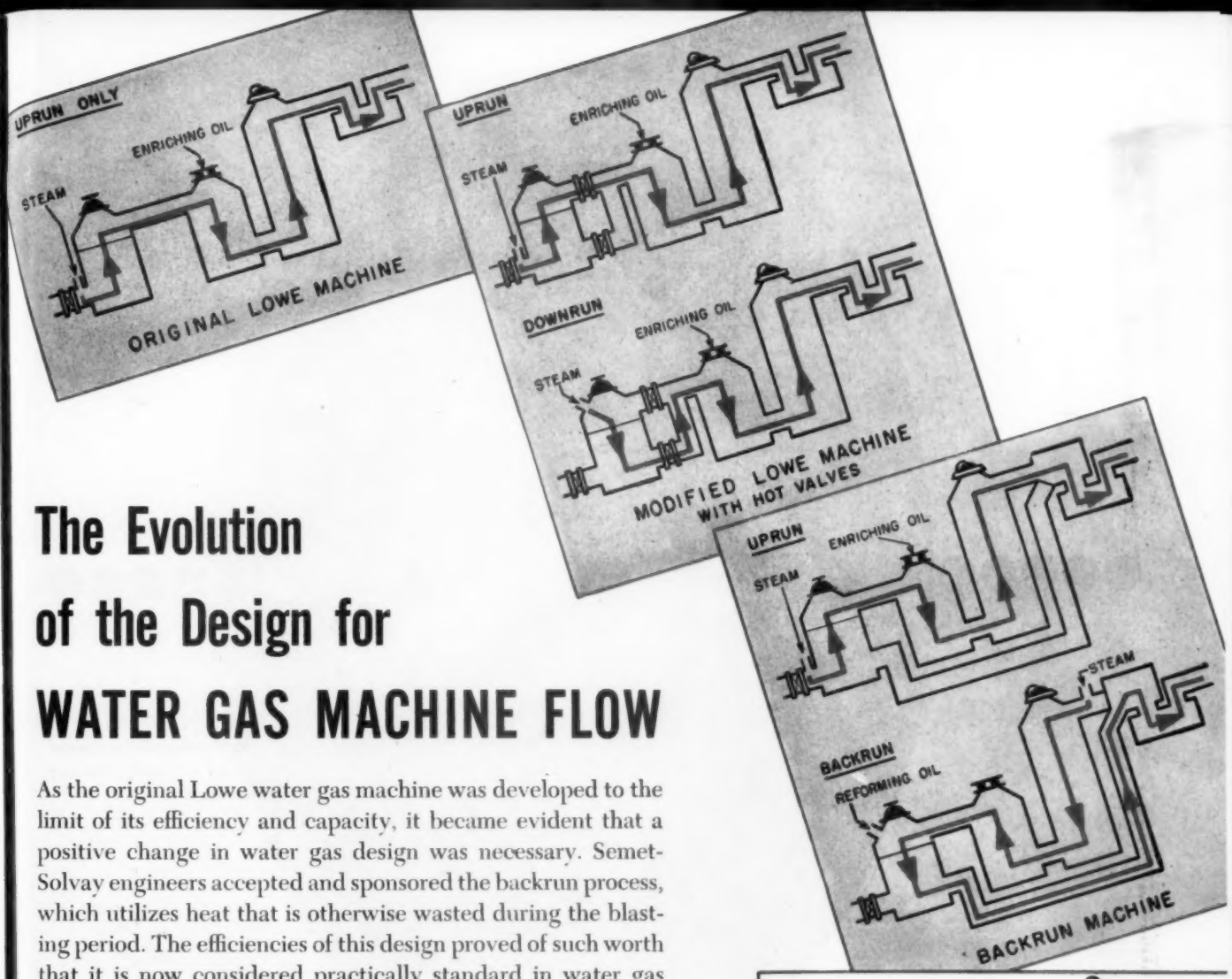

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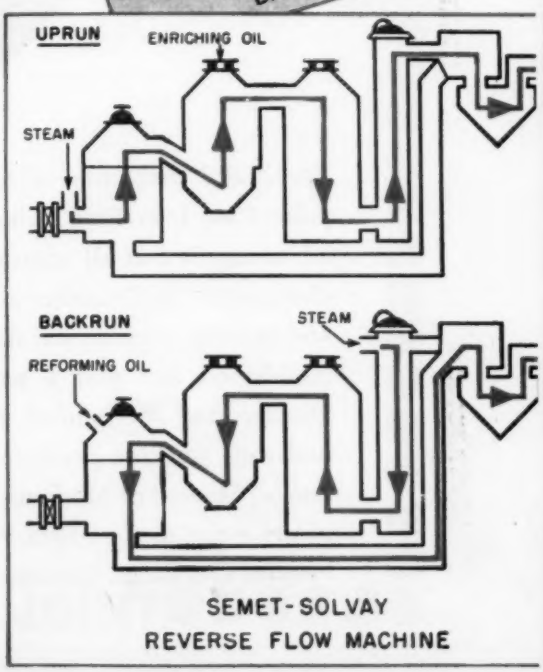

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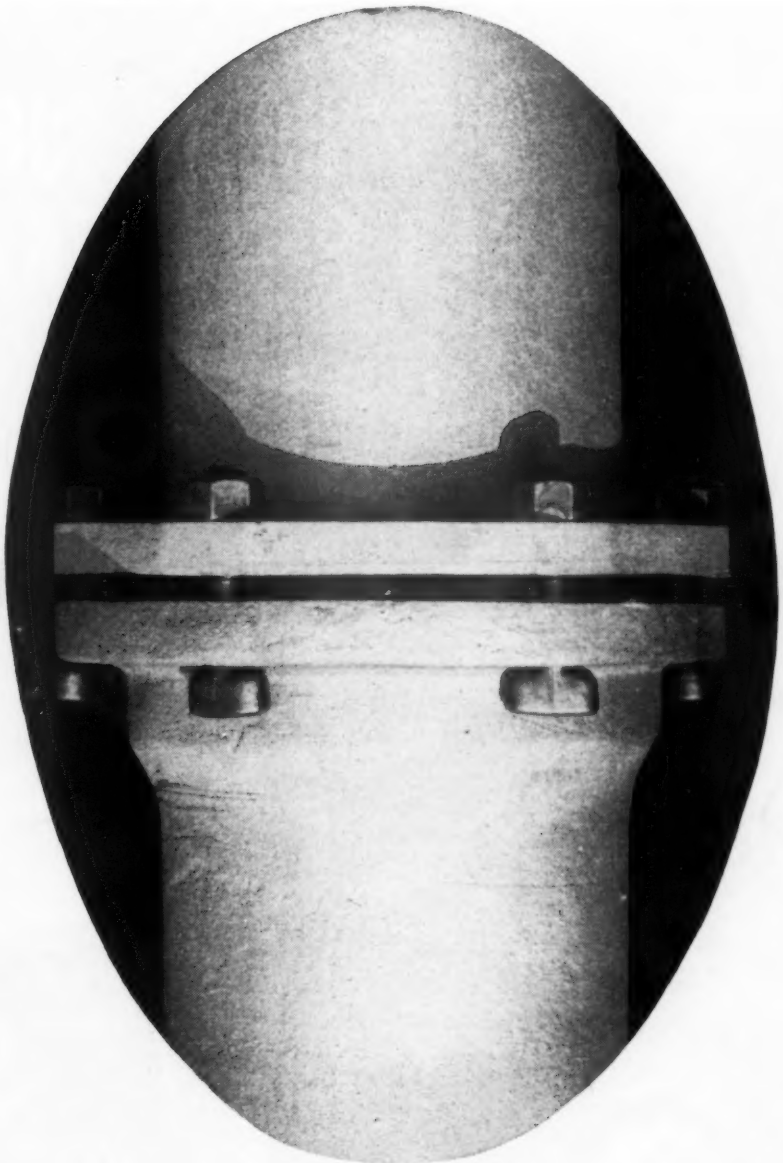

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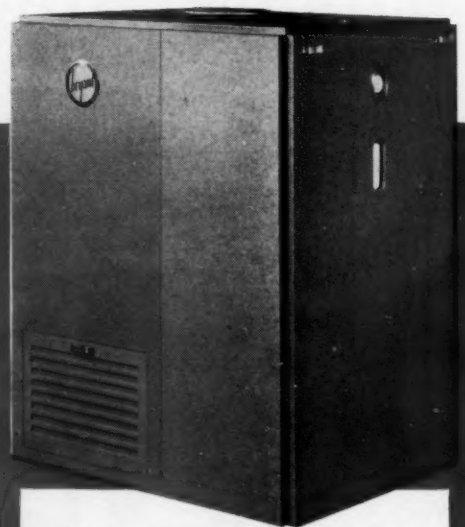

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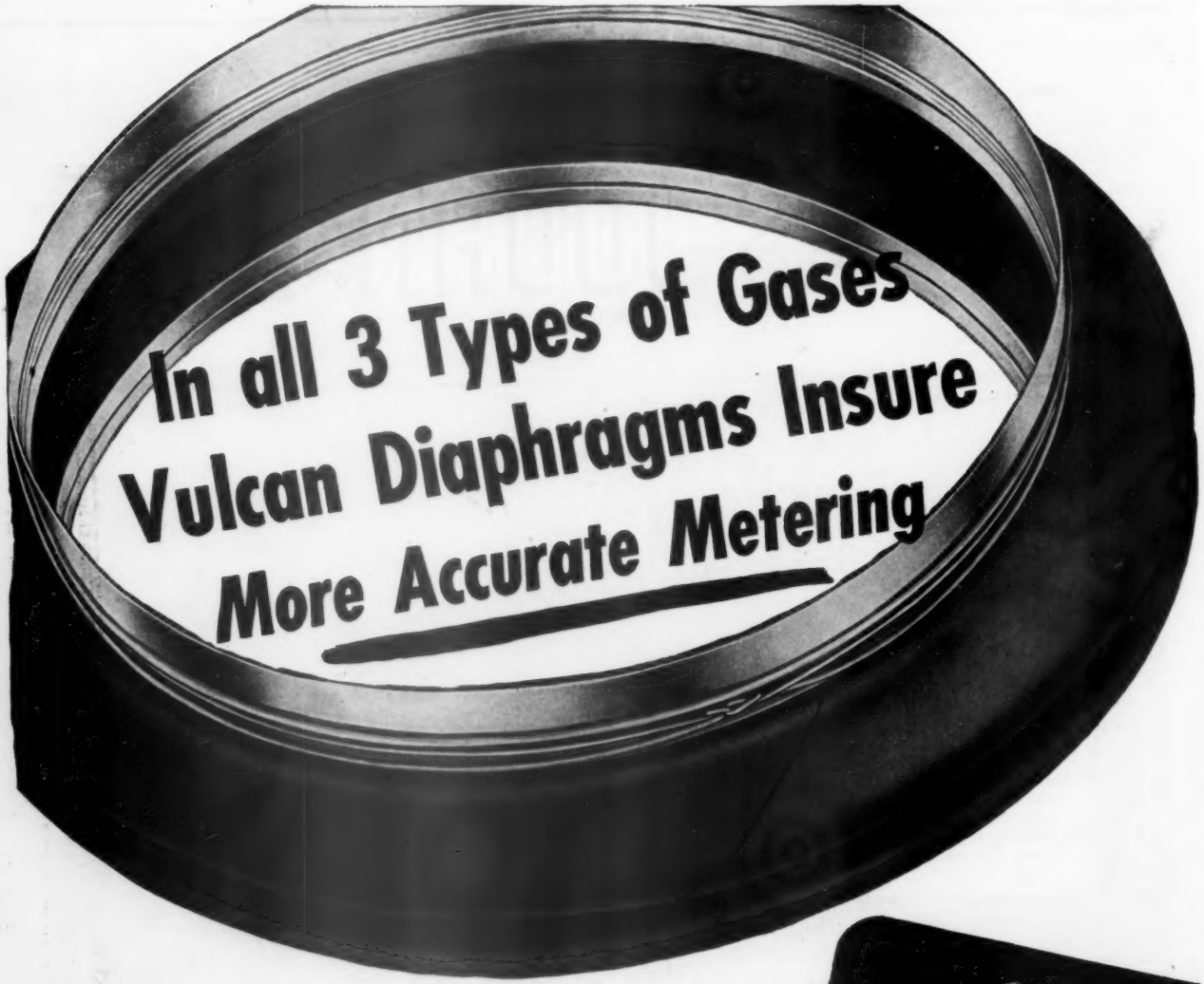

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AMERICAN
GAS JOURNAL

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Radiographing and Controlled Low-Temperature Stress-Relieving of Welded Tanks for Wet Seal Gas Holder

By
Rudolf Kraus*

IN RECENT YEARS welded construction has been used in the erection of several wet-seal gas holders. These, however, have generally been of relatively small capacity, the largest being a 5,000,000 cu. ft. wet-seal holder completely welded about a year and a half ago. The maximum plate thickness involved in that welded construction was 1⅜ inches. At present we are welding one of the largest of this type structure ever built, a 10,000,000 cu. ft. multiple-lift wet-seal gas holder. For those not familiar with this class of structure, Fig. 1 shows a schematic diagram of the wet-seal type holder.

The 10,000,000 cu. ft, holder has five lifts, each about 37½ ft. high, rising when inflated, about as high as a 22-story building. The welding of large holder lifts is fundamentally little different from the welding of smaller ones. Such work has been previously described in a paper published in December 1945.[1]

The welding of the outer lower tank or water tank is of particular interest because it is the largest welded tank in the world. The tank is 38 ft. 2 in. high and is nearly a fifth of a mile in circumference being 276 ft. 6 in. in diameter. The lower course of this tank is 1 49/64 in. thick. The thickness is reduced with each course to a minimum of ½ in. for the top course.

A.W.S. Rules for Field Welding of Steel Storage Tanks[2] which is the most liberal standard, limits field welding to 1½ in. maximum. Other important codes and standards, such as A.S.M.E. Unfired Pressure Vessel Code and the A.P.I.-A.S.M.E. Code limits welding to 1¼ in. thick without stress relieving, and 1½ in. without X-raying. Experience and service records have shown that these regulations and rules are safe and fundamentally sound.

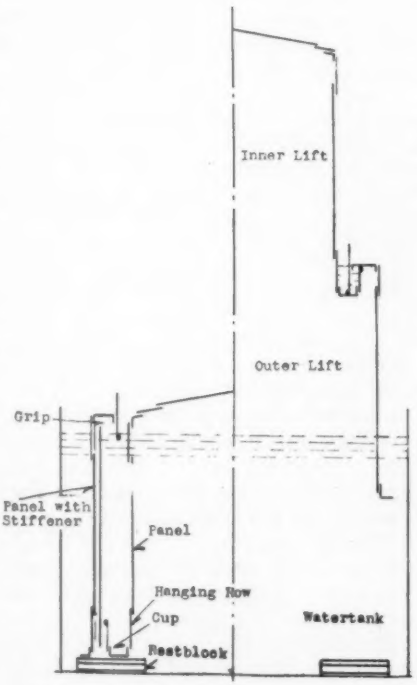


Figure 1 Diagram of Wet-Seal Gas Holder

After careful consideration of all problems of field welding of thick plate in such large and important structures, it was decided that the safest, soundest, and most constructive engineering basis for welding would be to apply the A.P.I.-A.S.-M.E. Code. In this code, when high quality steel or boiler plate is used instead of structural or tank steel, the design joint efficiency is increased from 80 to 85 per cent. When the welds are stress-relieved, the allowable joint efficiency is increased another 5 per cent. When the welds are X-rayed, a further increase of 5 per cent is allowed. In other words, when boiler plate steel is used in conjunction with both stress-relieving and X-raying, a joint efficiency of 95 per cent can be used instead of 80 per cent in the design of A.S.M.E. vessels.

In the building of this tank, boiler

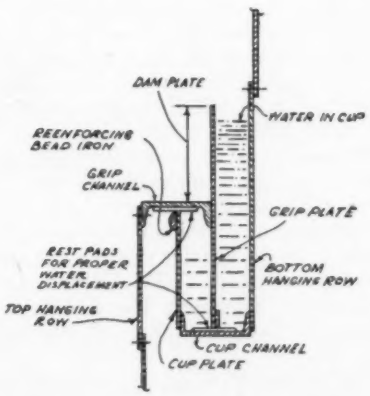


Figure 1a Detail of Cup and Grip Assemblies

* *Welding Engineer of Stacey Bros. Gas Construction Co.*

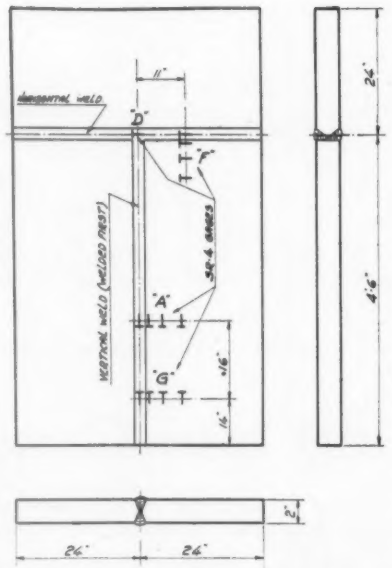
plate steel, A.S.T.M. A-70, was used throughout. As it was felt there was considerable background of experience in welding up to 1¼-in. thickness in the earlier holders, it was decided that in this first tank only the welds 1¼ in. thick and heavier would be X-rayed and stress relieved, using the Controlled Low-Temperature Stress-Relieving method. The tank was designed and built on this basis. The three lower courses where the thickness exceeds 1¼ in. were X-rayed and stress-relieved and a joint efficiency of 95 per cent was used in the design. For the remaining courses—less than 1¼ in. in thickness—which were not stress-relieved or X-rayed, the joint efficiency was considered as only 85 per cent.

It might be mentioned that if boiler plate, X-raying, and stress-relieving had *not* been used, the design would have required a plate thickness for the lower courses of 2 1/16 in. instead of 1 49/64 in. which was used in this tank.

Investigation of Residual Welding Stresses in Thick Plate

Since the maximum plate on the water tank of this large gas holder would be nearly 2 in. thick and since a considerable amount of welding would be involved in joining the plates in excess of 1¼ in. thick, it was necessary, first, to determine the exact magnitude of the residual weld stresses in such thick plates and, second, to determine the effectiveness of Low-Temperature Stress-Relieving in reducing them. The literature has recently contained considerable data on investigations of residual weld stresses, notable the work of DeGarmo, Merriam, and Jonassen [3] & [4] of the University of California, and investigators at the Massachusetts Institute of Technology and other institutions. However, practically all the published research had been limited to approximately 1 in. plate thickness, maximum 1¼ inches. Moreover, the investigations of the effectiveness of Low-Temperature Stress-Relieving, according to the publication by Greene and Holzbaur[5], had been confined to welds in plate thickness up to 1¼ inches. It was, therefore, decided to investigate the residual stresses and their relief in heavier thicknesses and the assistance of T. W. Greene, Development Engineer, The Linde Air Products Company, was elicited for this work.

To make this study, several rather large 4 ft. 0 in. by 6 ft. 6 in. weldments of 2 in. thick plates of A.S.T.M. A-70 steel were welded. See Fig. 2. These contained both a vertical and horizontal weld. All welds were made in position with the plates tacked and assembled in a fixed vertical plane, thus simulating actual welding conditions and procedures in the building of large steel tanks. The vertical weld was made first and then the horizontal weld as in field construction. For the vertical weld the plates were double-vee beveled to an included angle of 45 deg. and root spaced 1/8 in. to 3/16 inch. After the root bead was applied, the vertical weld was completed in 5 to 6 passes from each side by two welders working on opposite sides. For the horizontal weld numerous stringer beads were applied by two welders working on opposite sides of the plate. All beads were layed continuously in the same direction from the start to the finish of each weld.



2" PLATE EXPERIMENTAL TEE WELDMENTS.

Figure 2

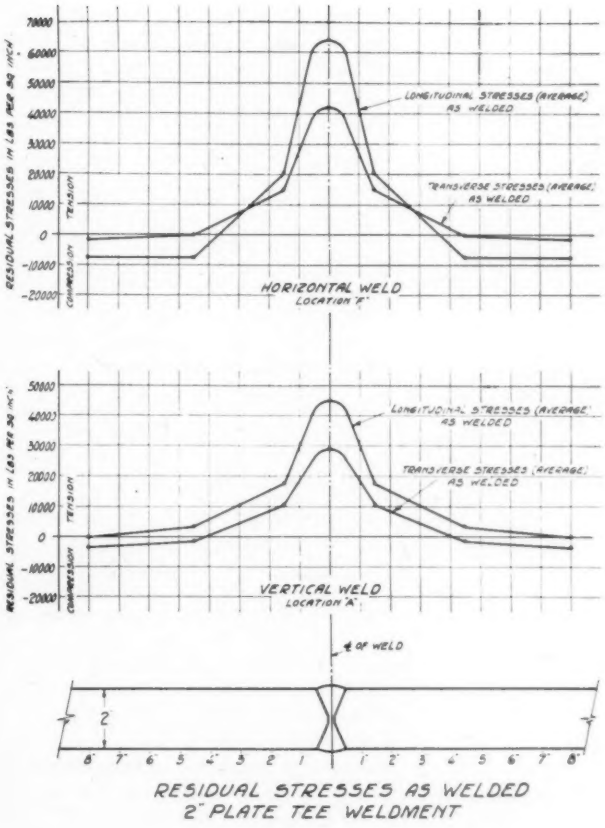
Measurement of the residual stresses were made by the trepanned relaxation method used extensively in such investigations.[3] & [4] SR-electric-resistance strain gages were cemented to the plate and welds on both sides directly opposite each other at various locations on the welds and adjacent plating. See Fig. 2. Pairs of gages were mounted both longitudinal or parallel to the weld and transverse or at right angle to the weld at every location. Initial readings of all the gages were taken and plugs containing a set of gages top and bottom were carefully drilled out, the 2 in. thick plugs being about 3½ in. long by 2 in. wide. The differences in the gage reading indicating the relaxed strain manifested on the surface were used in computing the residual stresses by the well-known equations of elasticity for a two-dimensional stress system.

As-Welded Stresses in 2-in. Plate

The residual stresses "as-welded" in the 2 in. plate with the T intersecting joint weldment are shown in Fig. 3. The stresses are presented for both horizontal and vertical welds. The stresses at the intersection are given in Table 1. These curves show some interesting data, which are, however, somewhat disturbing. It will be seen that the longitudinal residual weld stress-pattern is practically the same as has been reported in previous articles. But the stresses are very high, particularly at the intersection and along the horizontal weld. Stresses up to 65,000 lbs. per sq. in., average of both sides, were measured along this weld. The relaxed strain was practically the same for the two surfaces. This is very much higher than has been found by anyone in previous investigations on thinner material such as ¾ in. and 1 in. thick low-carbon medium-strength plate. What is more disturbing is that the transverse stresses are also high, being in excess of 40,000 lbs. per sq. in. for the horizontal weld. All other investigations, particularly the work of DeGarmo, Merriam, and Jonassen,[4] have shown that the transverse residual weld stresses are very low in unrestrained weldments of flat plates, either large or small. (Generally stresses have not exceeded 10,000 lbs. per sq. in. maximum and often residual compression has been found.)

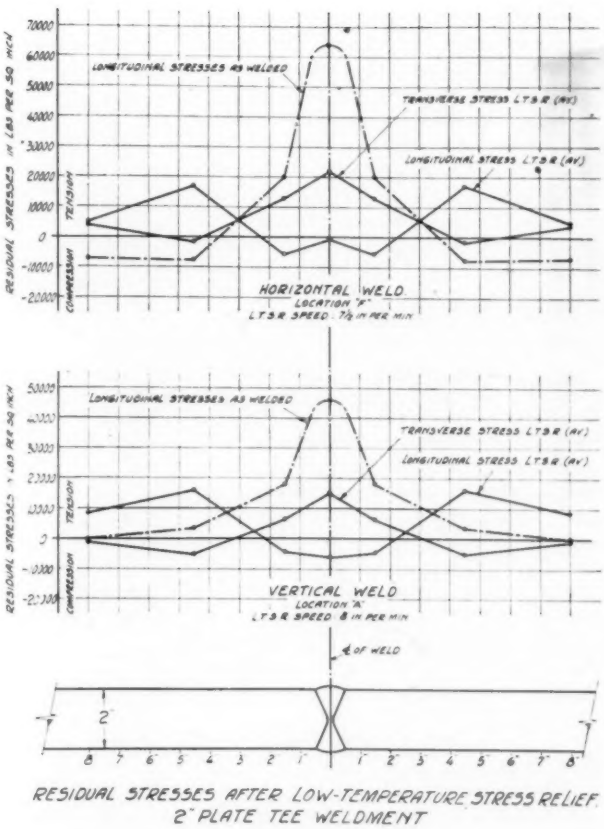
The stresses in the vertical weld are of typical pattern but are lower than for the horizontal weld. This is difficult to explain but it should be remembered that the vertical weld was made first, and consequently was less restrained. Possibly the higher heat input of two welders working almost opposite each other, depositing relatively heavy beads, may have had an influence. This condition did not exist on the actual job; the roots of welds were cleaned prior to welding from the far side.

It is believed that the high residual stresses in the longitudinal direction and particularly the unusually high stresses in the transverse direction, are evidence of triaxial stress. There must be a stress of appreciable magnitude in the direction of thickness. In thin plates there is little restraint in the direction of thickness and each bead tends to heat the total thickness. In cooling, the contracting metal decreases the plate thickness, even



RESIDUAL STRESSES AS WELDED
2" PLATE TEE WELDMENT

Figure 3



RESIDUAL STRESSES AFTER LOW-TEMPERATURE STRESS RELIEF
2" PLATE TEE WELDMENT

Figure 4

though the effect may be small and difficult to measure.

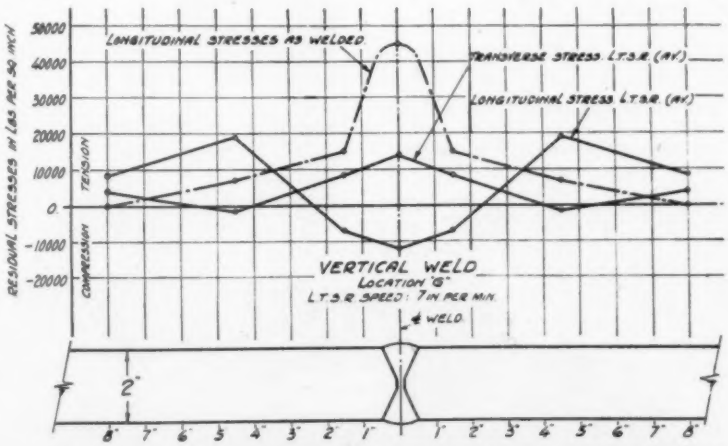
Low-Temperature Stress-Relieving 2-in. Plate

In Low-Temperature Stress-Relieving, the controlled heating treatment for relief of the residual weld stress is progressively applied at 350 deg. to 400 deg. F. from one side for plate thickness up to 1⅜ inches. In the heavier plates, because the lag of penetration of the heat through the thickness adversely affects the desired control for full relief, it is necessary to apply the heating treatment from both sides simultaneously. The treatment of 2-in. plate is in effect the treatment of two 1-in. plates. After a few preliminary trials on relatively small 2-in. thick weldments, low-temperature stress-relieving was applied to the same size weldments that were used to investigate the "as - welded" stresses. See Figure 2. All these weldments had been made at the start of the investigation. All weldments were treated in a vertical position. In some cases the vertical weld was treated first, in others the horizontal weld first. This is immaterial and one of the advantages of the process is that the sequence is not a factor.

Low-Temperature Stress-Relieving was done by progressively and simultaneously heating both surfaces of the plate with the heating applied opposite or nearly opposite. The heating was applied symmetrically in bands on both sides of the weld. Six-inch wide oxy-acetylene stress-relieving heads were used, spaced, as for thinner plates, on 10 in. centers, making the edges of the heating bands 2 in. from the center line of the weld. The speed of travel was varied purposely from 7 in. to 8 in. per min. in treating the weldments. As is standard practice for thinner plate, a water spray was impinged 6 in. to 8 in. back of the advancing flames to remove the excess heat and assist the heating treatment.

For further information about the theory and application of the process, see reference[5].

Figures 3, 4, and 5 show the residual stresses in the horizontal and



RESIDUAL STRESSES AFTER LOW-TEMPERATURE STRESS RELIEF
2" PLATE TEE WELDMENT

Figure 5

vertical welds after low-temperature stress-relieving the 2-in. plate weldments. For convenience or comparison the longitudinal stresses "as-welded" are shown in these curves. The average stress, top and bottom, are given, but the relaxed strain was practically identical on the two surfaces. These tests were repeated several times with modifications, in order to arrive at the best results by successive improvements.

It will be seen from these curves that low-temperature stress-relieving has reduced the high longitudinal stresses of 65,000 lb. per sq. in., in the "as-welded" state to zero values or to slight residual compression. The transverse stresses, which in these thick plates were unusually high, were reduced to ⅓ the as-welded values. It is believed that the stresses in the direction of thickness not measured in this investigation were also reduced a proportionate amount as would be expected from theoretical consideration. The optimum speed for treatment appears to be about 8 in. per minute—slower speeds simply increase the residual compression in the longitudinal direction.

Stresses at Weld Intersection

Of particular importance are the stresses at the intersection of vertical and horizontal welds, as this is generally considered a critical area. In Table 1 are given the stresses measured at this point in both the "as-welded" and "stress-relieved" weldments. It will be seen that the "as-welded" stresses transverse to the vertical weld are extremely high, 62,500 lb. per sq. in. This is, in reality, the magnitude of the stress found in the longitudinal direction of the horizontal weld. It should be remembered that at the intersection the longitudinal stress of one weld is the transverse stress of the other. This is particularly undesirable as the high residual stresses are in the same direction as the principal load stress on the vertical weld. It will be seen from the table that the Low-Temperature Stress-Relieving has reduced this high residual stress to slight residual compression.

TABLE 1

RESIDUAL STRESSES AT WELD INTERSECTION

	Transverse to Vertical Weld Lb. per sq. in.	Longitudinal to Vertical Weld Lb. per sq. in.
As-Welded	62,300	3,000
After Low-Temperature Stress-Relieving	—6,700*	4,300

** Sign indicates residual compression.*

Field Welding 10,000,000 Cu. Ft. Holder

The erection and welding of such a large structure as a 10,000,000 cu. ft. holder must be carefully planned and co-ordinated step by step. Welding represents only a small portion of the work involved in building a large gas holder. The term "welded fabrication" covers the problems better. After the floor plating is laid on the concrete foundation, the outer or water shell is erected and welded. Fig. 6 shows this outer shell about half complete, and Fig. 7 shows the interior view of this largest welded tank in the world. Inside the tank, five separate lifts must be erected, also the supports for the crown, as well as the crown itself for the inner lift. This necessitates that the various service supply lines and power lines must be outside the tank. For the welding supply current, a 440-volt buried line was laid outside the tank and batteries of welding machines were located at convenient intervals, the welding leads being taken up and over the tank.

All the welders were required to pass the necessary qualification tests including welding overhead. All were informed of the importance of the job and that the welds would be X-rayed. From the first, before the X-ray apparatus was assembled, the welds were checked by removing boat-shaped plugs or segments with a weld prober.

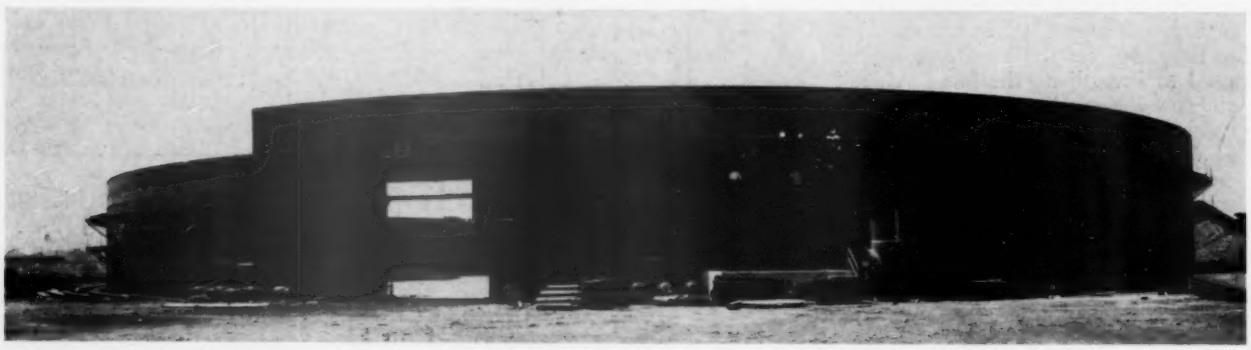
The sequence of welding of such heavy plates is important and a procedure was set up and strictly adhered to throughout. The vertical seams of each course were welded inside and out on the heavier plates before the horizontal seams were made. A fairly heavy root bead was first applied from the outside. This was back-chipped and carefully examined, and then the inside welding completed, followed by the welding outside. Each bead was examined carefully, chipped when necessary, peened, and wire brushed. The same procedure was followed for the roundabouts or horizontal seams.

Field Radiographing

The field X-raying did not present any difficult problem and was carried on following the welding as the vertical seams and the welding joining two adjacent courses were fully completed. A portable 200,000-volt X-ray machine was used, mounted on a

Figure 6. General View of Outer or Water Tank for 10,000,000 Cu. Ft. Wet-Seal Gas Holder.

Five lifts, crown support, and crown are erected inside this tank so supply lines and welding machines must be located outside. Note window left in tank for entrance of crane and material. This will be the last thing welded on completion of entire holder and will be radiographed and low-temperature stress-relieved.



suitable truck which was wheeled around on the bottom of the tank.

All the vertical joints were X-rayed throughout and 18 inches of the horizontal seams at each intersection with the verticals were X-rayed where the plate exceeded 1¼ in. in thickness. The standards adopted in making and judging the radiographs were those established in the A.S.M.E. Unfired Pressure Vessel Code and the A.P.I.-A.S.M.E. Code. The X-raying showed the welding to be exceptionally good and only a few sections were cut out, principally because of slag inclusions or porosity. No cracks were shown in any of the pictures.

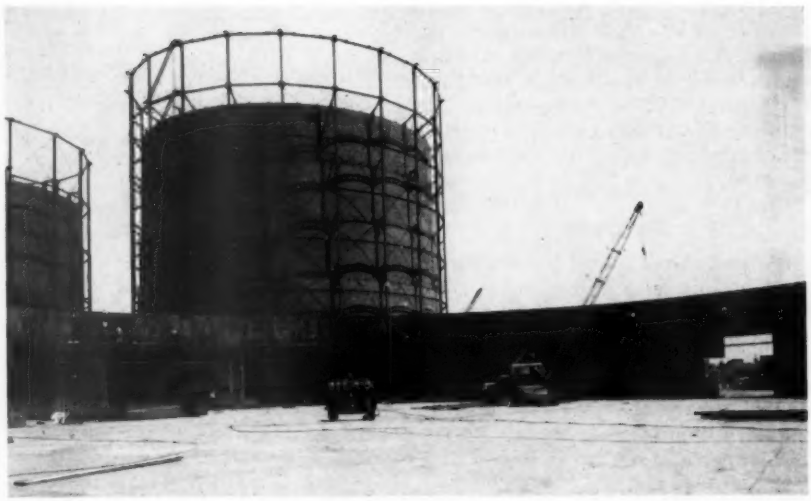


Figure 7 Interior View of Water Tank for 10,000,000 Cu. Ft. Holder.

When completed, this will be the largest welded tank in the world. Diameter of tank is 276 ft. 6 in. and the first course approximately 1-49/64 in. thick. Six-cylinder acetylene and oxygen manifolds mounted on truck are shown for supplying heating gases to stress-relieving apparatus on inside of tank. Similar manifolds are located outside as the low-temperature stress-relieving is done simultaneously inside and outside in treating welds in these heavy plates. The window is clearly evident in this photo.

Field Low-Temperature Stress Relieving

Controlled low-temperature stress-relieving was applied to all the vertical and horizontal welds where the plate thickness exceeded 1¼ inches. Some 2,200 ft. of welding were stress-relieved. As previously explained, the joint design was based on an efficiency of 95 per cent for the plates thicker than 1¼ in. where X-raying and stress relieving were applied. For the plates less than 1¼ in. thick which were not X-rayed or stress-relieved, a joint efficiency of 85 per cent was used in the design.

The low-temperature stress-relieving was done by progressively heating, accompanied by water-cooling six to eight inches behind the advancing oxy-acetylene flames, six-inch bands symmetrically located on each side of the welds with the inner edges of the heating flames two inches from the center line of the welds. This treatment was applied simultaneously and opposite, inside and out. To accomplish this low-temperature stress-relieving apparatus developed by The Linde Air Products Company was mounted on a variable-speed tractor running on curved tracks. These were mounted on suitable brackets hung on clips attached to the tank. The accompanying pictures show some of the apparatus and detail of the low-temperature stress-relieving treatment. The speed of travel for the various thicknesses established by experiments previously discussed were: 8 in. per min. for the vertical weld of the first course of 1 49/64 in.; 10 in. per min. for the second course of 1 33/64 in.; and 12 in. per min. for the third course of 1 17/64 in. For the horizontal seams, the speeds were 10 in. per min. for the first roundabout, and 12 in. per min. for the second, favoring the thinner plate.

Figure 8 Low-Temperature Stress-Relieving a Horizontal Weld

The stress relieving equipment is moved on its curved track by a variable-speed tractor. Similar equipment is mounted inside as the low-temperature stress-relieving treatment is applied simultaneously inside and out. Speed of travel was 8 to 12 in. per min. depending upon the plate thickness.

Although some trouble was anticipated in co-ordinating the inside and outside heating, the entire job was done without difficulty. Reference marks were laid out at ½ ft. and 1-ft. intervals, along all seams both inside and outside the tank. One machine established the correct speed and the other machine on the other side was co-ordinated with this by means of established signals hammered on the tank.

The stress-relieving was sometimes done before and sometimes after X-raying. Where the welds were found defective by X-raying, they were simply locally stress-relieved again after repair. This is one of the advantages of the low-temperature stress-relieving process.

The accompanying tables give an estimate of man-hours and gases required for stress-relieving of this tank. The gases, both oxygen and acetylene, were supplied from six-cylinder manifolds mounted on suitable carts, one inside and one outside the tank.

Summary

In the construction of the water tank of this first all-welded 10,000,000 cu. ft. wet-seal gas holder, all welds in plate thickness in excess of 1¼ in. were both field radiographed and Low-Temperature Stress-Relieved. Practically all codes limit the thickness that may be welded without X-raying or stress relieving to 1¼ inches. In the building of this holder, the A.P.I.-A.S.M.E. codes were used as a basis of design in which a higher joint efficiency is allowed for use of high quality steel, X-raying, and stress-relieving. A joint efficiency of 95 per cent was used for welds 1¼ in. and thicker, which were X-rayed and stress-relieved. As boiler plate steel was used throughout, 85 per cent joint efficiency was used for welds less than 1¼ in. thick which were not X-rayed or stress-relieved in this tank.

Investigation of the residual welding stresses in heavy plates 2 in. thick showed the residual stresses to be much higher than has been measured in relative thinner plates of 1 in. thickness. Stresses as high as 65,000 lb. per sq. in. were measured. These were reduced to nearly zero values and to safe limits in all directions by Low-Temperature Stress-Relieving. It is believed that the soundest engineering approach to the field welding of such large important structures is to institute the use of the highest quality of materials and of construction including X-raying and stress-relieving which deservedly should be compensated for by the saving in steel.

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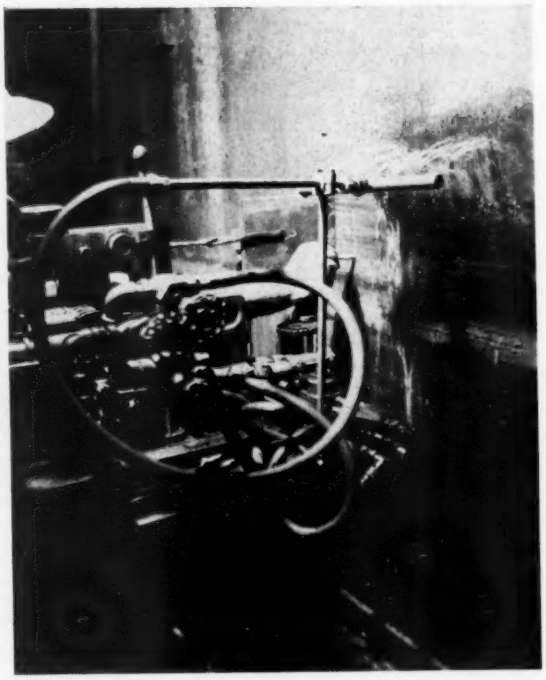

Figure 9 Checking the Temperature of the Heat Bands in Low-Temperature Stress-Relievtng.

The temperatures of the heat bands are checked with temperature indicating crayons. The flames are temporarily screened off with a small steel plate. Temperature of 350 deg. to 400 deg. F. is used in Low-Temperature Stress-Relieving although slightly higher temperature is permitted when heating simultaneously inside and outside.

TABLE 2

THEORETICAL STRESS-RELIEVED SEAM FOOTAGE AND TORCH HOURS

	Seam Footage	Rate	Torch Hours
1st Girth seam (1-49/64" to 1-33/64")	850 ft.	50 ft/hr	17 hrs.
2nd Girth seam (1-33/64" to 1-17/64")	850 ft.	60 ft/hr	14.2 hrs.
84 Vertical seam (5' 10" long)	500 ft.	50 ft/hr	10.0 hrs.
TOTAL	2,200 ft.	160 ft/hr	41.2 hrs.

TABLE 3

ESTIMATE DIRECT LABOR FOR STRESS RELIEVING

	Seam Footage	Overall Days	Time Hours	No. of Men	Man Hours
Two girth seams of 850 ft. each	1,700	7	56	5	280
84 Vertical seams	500	3.5	28	4	112
Foreman for 10.5 days					84
TOTAL	2,200	10.5	84	9	476

Overall Efficiency of Theoretical Torch Hours $\frac{41.2}{84}$ = 49 per cent

TABLE 4

OXYGEN AND ACETYLENE GAS CONSUMPTION

Oxygen	24,700 cu. ft. = 600 cu. ft. per hr. for 41.2 hrs.	= 11.2 cu. ft. per ft. of seam
Acetylene	24,700 cu. ft. = 600 cu. ft. per hr. for 41.2 hrs.	= 11.2 cu. ft. per ft. of seam

Underground Storage of Natural Gas

United States Steel Corporation in reporting on steel-making progress in 1947, refers to storage vessels for natural gas as follows:

"An installation using pressure vessels fabricated from lengths of seamless steel pipe for storing 1,250,000 cubic feet of natural gas at 2240 pounds per square inch pressure was placed in service during 1947, in addition to a similar unit capable of storing 40,000,000 cubic feet of natural gas. The vessels are of alloy steel seamless pipe, 24 inches in outside diameter and 0.512-inch wall thickness, swaged to contour in five stages under a steam hammer. It is expected that storage units of this type will meet a long-felt need, since individual vessels may be taken out of service without disturbing the others, no aviation hazards are involved, and the units are not affected by storms or rapidly fluctuating temperature conditions. Practically any capacity can be obtained by selecting the proper number of units. Single units weigh about 5000 pounds a piece before coating."

Installation of this type was described in the March 1947 issue of this JOURNAL, page 13.

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Automatic Controls and Their Functions

Thermostat

REGARDLESS of the type of thermostat involved, the proper location of the instrument plays an important part in the control of the temperature.

The most logical place for the thermostat naturally is in the room where closest control is desired. This usually is the living room, but other rooms having about the same characteristics will serve the purpose. For instance, thermostats are frequently mounted in the dining room, and this practice is all right provided the location complies with the other rules given below.

Hallways generally are poor locations, for the instrument is affected by opening of outer doors, or by cold air coming down stairways.

The thermostat should be located where it can quickly feel the temperature change of an average interior room without being affected by temperature changes other than those produced by the heating plant and the general heat loss of the room.

Certain general rules may be laid down regarding thermostat location:

1. The thermostat should always be on an inside partition-never on an outside wall.

2. Do not mount the instrument on a part of the wall that has steam or hot water pipes, or warm air ducts behind it.

3. The location should be such that direct sunshine or fire-place radiation cannot strike the thermostat.

4. Be careful that the spot selected is not likely to have a floor lamp near it or a table lamp under it.

5. Do not locate it near an outside door, or a radiator, or where warm air from a supply-grille can strike it.

6. Do not locate it where heat from kitchen appliances can affect it, or on a wall which has a cold, unused room on the other side.

7. After a thermostat has been mounted, it is wise to fill the stud space behind the instrument with insulating material to prevent any circulation of cold air. Further, the hole behind the thermostat through which the wires come should be sealed so that air cannot emerge from the stud space and blow across the thermostat element. It is quite common to find considerable air motion through this hole, caused by "chimney effect" in the stud space.

The membership of the Rocky Mountain Gas Association is largely composed of gas appliance retailers and manufacturers and plumbing and heating contractors. The service to its members consists largely ln supplying them with the most approved data on the installation of gas appliances and accessories, to give the most satisfactory service to the customer. This instruction sheet on Automatic Controls is of universal interest.—Ed.

Remember the thermostat location has nothing to do with the heat balance of the various rooms. For example, if one room runs cool, it does no good to move the thermostat to that room. True, putting the thermostat there will make that room warm, but at the same time the other rooms will be overheated. The same result could be achieved with the original location by setting the thermostat at a higher temperature. All cases of certain rooms running too hot or too cold must be corrected by changing the heat input to that room, or the heat loss from it, and not by moving the thermostat.

If a thermostat is mounted in a room so that it does not quickly feel the temperature changes in that room, overshooting will result. It will thus appear that the thermostat has a wide differential, when in reality it is the heated space itself that has the wide differential.

Over-radiated hot water systems may "overshoot" because when the thermostat shuts down the unit, there is a considerable mass of metal and water to give off heat to the room. "Overshooting" also occurs on gravity warm air and steam systems to a lesser extent. In all instances overshooting occurs because the thermostat feels the change in room temperature when the proper amount of heat has been added, but cannot take into account the extra heat stored in the radiators. Preheat coils were developed to counteract this effect.

Under-radiated or sluggish hot hot water systems however are sometimes hindered by a thermostat heater coil and in most cases of underradiation on hot water or steam the preheat coil is removed, common sense dictates should govern the use of heat coil in these installations.

Use of Thermostat Heater Coils

A thermostat heater coil is a small resistor mounted near the sensitive element of the thermostat, which warms up when the furnace starts. This causes the thermostat to stop the furnace after a running cycle, the length of which in a constant temperature depends only on the size of heat coil. The usual running cycle with two-degree differential will be 12 to 15 minutes with no change in room temperature; but of course, if the room temperature rises the cycle will be shorter. This action of stopping the unit before the room temperature has changed much, in effect allows the "overshoot" to coast the temperature up to the thermostat setting, instead of beyond it as would happen without the preheat coil. Further, as the preheat coil cools, the thermostat tends to start the unit before the room temperature falls very much. This action of preventing much actual change in room temperature by "anticipating" the change gives the effect of a very close differential on the thermostat and thus results in much more uniform temperatures.

The shorter and more frequent the cycles are, the smoother will be the temperature control. However, there is a point where frequent starts would not be worth the slight gain in uniformity of temperature.

Automatic Gas Valve

The function of the gas valve is to start and stop flow of gas into the furnace or boiler according to the needs of the room thermostat or other controlling devices.

Care should be exercised when applying pipe dope to the threads. Dope should never be placed on the inside threads of any valve because the dope may become lodged on the valve seat and prevent positive shutoff or otherwise hinder normal functioning of the valve.

The gas valve should always be installed so that it is not tipped in any direction since certain solenoid valves especially may have a tendency to stick it not perfectly installed.

A gas valve should never be installed in a location where high temperatures exist.

Fan and Limit Switches

Both the fan and limit switches are operated by a thermal sensitive element which extends into the bonnet of a forced air furnace. The function of the limit switch is to limit the temperature of the air in the bonnet of the furnace, to protect the furnace and its controls. This switch is usually set to shut off the gas valve when the bonnet temperature reaches not more than 200°F.

The fan switch function is to turn the blower motor on and off according to the temperature of the air in the bonnet of the furnace. The recommended temperatures are to have the blower start operating at a bonnet temperature of 160°F and turn off the blower when the bonnet temperature drops to 130°F. It will be found in practice that no definite setting can be used in all cases. Usually, some unusual condition exists which will necessitate settings other than those recommended. The temperature settings recommended will be suitable for a large percentage of the jobs but will not satisfy all contingencies. Many manufacturers supply information along this line, but again it can be used only as a guide.

Aquastat

An aquastat generally is used as a high limit control on a hot water installation as a means to insure maintaining the temperature of the water in the system below a predetermined setting. The setting is determined by the type of system and the needs of the particular installation.

Safety Pilot

A safety pilot is a device designed to prevent gas coming on to the main burner in any case of pilot failure. Many different types of safety pilots are being manufactured and consequently it would require a great deal of time if each type was taken up separately, so it must be limited to a general discussion of safety pilots.

It is recommended, as a safety precaution, that an interlocking main and pilot valve of the Pearson valve type or its equivalent be used whenever possible as a protection during the lighting period.

One safety pilot in common use today is the thermocouple type. The principle of the thermocouple is simply two dissimilar metals used together at one point and this point heated by the flame of the pilot burner. This point of fusion is called the hot junction and the other end of the two dissimilar metals which is not fused is called the cold junction. It is necessary to maintain a temperature differential as great as possible between the hot and cold junctions to generate enough electrical energy to energize a coil of wire which in turn through proper mechanical linkages makes a set of electrical contacts.

Another common type safety pilot is the bi-metallic, type. This safety pilot operates on the same principle as a thermostat, that is, too dissimilar metals which have different coefficients of expansion placed one on top of the other. Heating and cooling causes a flexing of the bi-metallic element which operates a rod which in turn operates a switch, or a set of contacts. There are of course, several variations of this type of safety pilot but the principle of operation is the same for all.

Pressuretrol

The pressuretrol is a pressure limiting device on steam installations. It is recommended that a pressure limiting device be installed with all gas fired steam boilers in order to protect the boiler from excessive pressures. In most cases the necessary explanation of adjustments is on the case of the instrument.

Low Water Cut-Off

A low water cut-off is simply what the name implies. This control is used on a steam boiler to interrupt the current supply of the gas valve in case of the water level in the boiler becomes lower than a predetermined point. In some installations the low water cut-off is so arranged that when a low water condition does exist in the boiler, automatic water feed is employed. It is used in most installations primarily as a safety control.

L. B. Smith Appointed Gen. Mgr. Kankakee Works

L. B. Smith, vice-president and director of the A. O. Smith Corporation, has been appointed general manager of the Kankakee Works of that company, according to an announcement made recently by W. C. Heath, President.

H. F. Detrick, who has held that post since the Kankakee Works went into production, has been carrying a dual responsibility, according to Mr. Heath. In addition to building the Kankakee organization from nothing up to a group in excess of 1,600 employees, he has at the same time continued to carry on his former duties as President of the Smith Meter Company of Los Angeles, a wholly owned subsidiary of the A. O. Smith Corporation.

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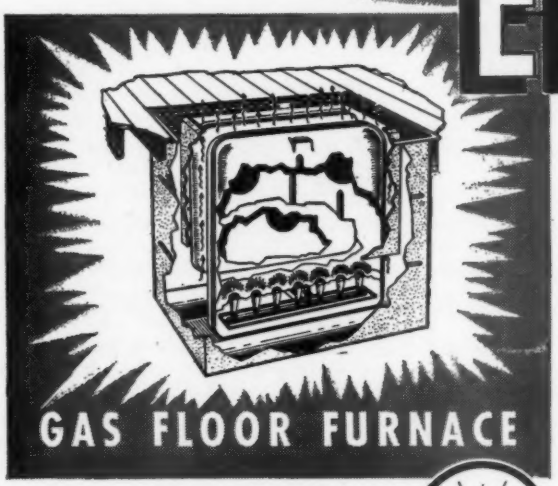

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Natural Gas Outlook for the Glass Industry

By
Franklin T. Rainey
General Sales Manager
The Ohio Fuel Gas Company

THE natural gas industry, like your own, has had tremendous growth over the last several years. In many cases, the demand for natural gas has risen to an all time peak and, in some instances, the demand has increased 100 percent over that of the prewar years. Along with this increasing demand, our industry has been unable to secure sufficient steel for pipe lines, and other materials necessary to keep its facilities in step with this growth. So great has been this demand, both domestic and industrial, that gas companies serving over 60 percent of all the gas consumers in the United States have found it necessary to put into effect restrictive policies limiting new uses of gas. Most of these restrictions apply to the use of gas for space heating purposes, although some companies are denying new applications for further expansion of industrial service. Those companies now allowed to take on additional industrial service are taking it on, on an interruptible basis, which provides for curtailment during peak winter requirements. Most of the glass companies have assisted materially in solving these restrictive policies by the installation of standby equipment utilizing other fuels.

Naturally, your industry is interested in the outlook for natural gas for the future. Every day, such questions as, "Is there a shortage of natural gas?" "How many years will the gas supply last?" "How can the utilities operate and maintain good service when their winter requirements are three to six times that of their summer requirements?" and countless other questions are asked.

First, let us consider the matter of natural gas supply and the reserves behind this supply. Estimates of gas reserves have been made for many years, and one of the noteworthy facts in this connection is that the total supply has steadily increased during this period. One of the earliest estimates was made by Shaw in 1919, in which the United States Natural Gas Reserves were found to be fifteen trillion cubic feet. The total reserves, at the end of 1946, as computed by the American Gas Association's Committee on Reserve was 160 trillion cubic feet. In arriving at this total gas reserve figure of 160 trillion cubic feet, only those fields having individual reserves of 20 billion cubic feet or more were included. If there be added to this estimate the 6,000 smaller fields not included therein, it is estimated that total natural gas reserves today would be somewhere in the magnitude of 200 trillion cubic feet.

With extensive drilling and growing demands, it is only natural that gas reserves should continue to increase for some time. The remarkable fact is that the increase has grown year by year and, for the country as a whole, it has far out-reached even the tremendous increased demand.

In Table 1, the various states have been grouped as Appalachian, Southwestern and All Others. This table shows reserves on December 31, 1945, with additional discoveries during 1946. Production in that year was the net difference between discovered and produced volume, and the resulting reserves on December 31, 1946. This table is adapted from the American Gas Association's Committee on Rserves. It shows, among other things, that the Appalachian area produced 175 billion cubic feet more gas than was discovered during the year, whereas Texas added by new discoveries during the year, 8 trillion cubic feet more than the 2 trillion produced.

Table 2 is intended to show approximate relationships for various states and districts. It also shows the number of years reserves would last at the 1946 constant rate of removal.

The problem confronting the gas industry is to provide the connecting link between this tremendous gas supply and the points of market requirement, in adequate amounts and at reasonable prices. In recent years, many long distance transmission lines extending from the Southwest —Eastward, Northward and Westward—have been built and tremendous volumes of gas have become available to remote areas never before having had this service. Reference is made to the pipe line map showing the major trunk lines for natural gas in the United States and, at the present time, many more are contemplated. To show the rapidity with which expansion is taking place on these long distance transmission lines, I quote from Release No. 3459 (G-1141) of the Federal Power Commission, as follows: "Construction and operation of new facilities to increase the capacity of the nation's natural gas pipe line systems by nearly 2 billion cubic feet per day, were authorized by the Federal Power Commission during the 12-month period from July 1, 1946, to June 30, 1947" Chairman Nelson Lee Smith announced. "Cost of the facilities authorized was estimated at $273,190,302, of which an estimated $257,448,776 was for projects, each costing $700,000 or more. These larger projects were planned to benefit nearly 80 major cities and numerous smaller communities in 20 states, many of them in the Appalachian and mid-western areas, where gas shortages have been prevalent. The unprecedented postwar activity in the natural gas industry has continued during the past in even greater measure than between July 1, 1945, and June 30, 1946, when the Commission authorized construction amounting to $127,189,731. Over twice as much was authorized this year and last year's record was outstanding in the history of the Commission."

Many utilities have added further to their facilities for providing additional supplies of gas by the installation of liquid petroleum standby plants to augment the supply of gas in cold weather. This is similar to the installation made by many of the glass industries, but on a much larger scale.

Tables referred to are available through the author.—Ed.

Abstract of paper presented before Ninth Conference on Glass Problems, University of Illinois, Urbana, Illinois, December 4, 1947.

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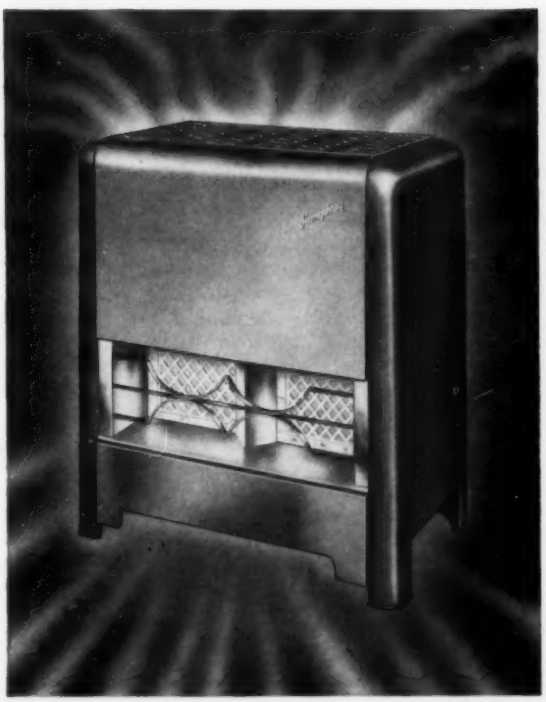

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How to Make Safety Meetings Click

By
J. W. Read

General Plant Employment Supervisor,
Ohio Bell Telephone Company

THE SUBJECT assigned to me—"How to Make Safety Meetings Click"—is, in my opinion, of utmost importance in our accident prevention job. Certainly the holding of effective safety meetings is one of the key tools in our kit, and possibly is second to "direct on-the-job supervision." This important medium in our accident prevention efforts is one which emanates the human approach, makes each and every employee a participant in the program, affording the employee with an accurate knowledge of the problem, and integrates the accident prevention phase of the work operation into the day-to-day job and not just an overlay on the job. Meetings maintain the wholesome interest of the entire employee group and assist in building the job pride and team play necessary to keep our accident experience at an irreducible minimum.

But not to stray too far from our subject matter — just what makes these meetings click? To recite a platitude to you, I believe Rudyard Kipling gives us a good approach to this question in his pithy saying:

"I keep six honest serving men
They taught me all I know
Their names are *What* and *Why* and *When* and *How* and *Where* and *Who*."

Let's apply this to the safety meeting that clicks.

What kind of meeting?

There are generally three types of meeting.

The "gang" meeting usually held by the foreman, which we know produces good results if properly done. These meetings are the intimate meetings on the job, in the garage, in the class or conference room. Just the foreman with those for whom he is responsible. The foreman should be assisted. He should have conference leader training and should have available package material to make his meetings interesting and to make them produce the good results that we know can be obtained. Planned discussion of past experience, not only that of his group, but in related activities outside his group. In the telephone business, a monthly pamphlet; "How Plant Men Are Injured," describes significant accidents and is an excellent source of material for our foreman's meetings. New and revised work methods and safety lesson plans may be discussed, and the meetings frequently are used for introduction of new work techniques. The planning of the more complicated or specialized job, such as extensive tree trimming, the ticklish underground job, the wire or cable job near power lines, may also be discussed. If meetings are properly planned and if assistance is given, most of the foremen can do a very creditable job in affording their people with first hand on-the-job information, indicating our honesty of purpose based on the facts of the immediate and contemporary situation.

The Safety-Graph is an excellent tool, which was developed by the National Safety Council for use in such meetings. Those of you who have not used this material could well afford to investigate the Safety-Graph, since it is of great assistance to the group leader and can be adapted to almost any matter of coverage.

There is an excellent opportunity in meetings of this type—to use visual aids, movies, slides and strip films. Many types of these may be obtained from the National Safety Council. They can also be prepared locally in an inexpensive fashion. One of the telephone companies has a station wagon in which is mounted a motion picture projector and demonstrating equipment, in which they bring such visual aids directly to the job, so that meetings can be conducted at most any location.

You "Power" people have done an excellent job in your so-called "tailgate board" meetings, as is shown in the sound strip "Pole Top Pals." We in the telephone business, have a strip film called "Construction Crew Planning," and there are a number of others which are available through the National Safety Council. In this type meeting each gang member should contribute, then the foreman can get a good idea of the effectiveness of his training job and what his crew's training needs are.

So much for the gang meeting.

Many companies hold so-called district or departmental meetings. The size of these meetings is usually from 10 to 125 employees. These meetings generally take an hour or so; are held on company premises, garages, storerooms, conference rooms, etc., and are usually conducted under the direction of the local district superintendent. A brief talk frequently is given by a division superintendent or the general manager, which demonstrates management's whole-hearted support of the accident-free job. These meetings should include a review of performance, an outline of the job ahead, movies, charts or model demonstrations, and a period for general discussion.

Then there are the annual dinner meetings.

In these, some companies follow a plan wherein the vice president or general manager has an opportunity to discuss the accident prevention job in a very short talk. A review of the accomplishments for the year is given, and this type of meeting affords an opportunity for presentation of trophies or other awards, where award plans are used. Meetings of this sort frequently include some type of entertainment and with such groups, sport movies on football, baseball or golf, are popular. Other types of entertainment would include either local talent or professional productions.

There are also one-day meetings for employees who are scattered over wide areas. For these, the employees are brought to a centralized point. In addition, many companies plan one-day meetings for supervisory only, to consider some special aspects of the accident prevention job—and I believe you are familiar with the general scope of these meetings.

I believe this covers the *What* phase of our problem.

Why should we have a meeting? I believe we should recognize that any meeting requires time away from the productive job. If we have no sound reason for the meeting, we are better off without it and we certainly avoid the reaction which we sometimes hear resulting from the unplanned, unnecessary meeting—"that was time wasted." We should first plan with a well established reason as to why we should have a meeting. Then, if each meeting is planned to its last detail, we will have gone a long way toward our objective, that of making the meeting **click.**

When should we hold such a meeting? As stated, only when there is a sound reason and only when our objective is clearly established. These

determinations can only be made in the light of accident experience factors that are peculiar to your job or your business. The experience and training of your force and the job ahead at a particular time, would be some of the factors determining *"When"* meetings should be held.

Where should the meeting be held? The meeting should be held at a location which is most accessible to all who are to attend. It should be held where we have adequate facilities, such as seating arrangements, proper ventilation, minimum outside interference, and at a location that affords us all the physical requirements to do a well planned job. It is recognized, of course, that some of these will need to be sacrificed for the many other advantages which accrue in the first general type of meeting mentioned, the gang meeting on the job.

Who should attend the meeting—and *Who* should conduct the meeting—are matters, again, of good planning. We should assure ourselves of proper representation and that the individual conducting and leading the meeting is an individual who is capable of doing so, and that he has been afforded the training and materials to do a job which is acceptable and meets the objective.

And now as to *How*, specifically, to handle the meeting and have it follow the plan you have prepared. What are some of the mechanics of conducting a good meeting?

1. Have a plan—establish your objective. Plan to meet your objective by the use of the tools available to you.
2. Stick to your subject. Don't wander but stick to your plan and therefore your subject.
3. Be considerate and understanding of your conferees. If a question is presented and your plan has not contemplated such a question or reaction, don't delay—settle it at the time of presentation. Don't promise that you will get back to it and then forget it. If the question is premature, honestly advise your conferee that you will get to it—and live up to your promise. In this connection we would be remiss if we didn't mention—rapport—the psychologists have given us this term for harmonious relationship between individuals. Such a relationship, both mental and physical, is necessary for a true and accurate understanding. You might say the meeting is a selling endeavor with all sales resistance removed. In our meeting we must have good rapport, both mental and physical.
4. Keep your props under cover. If you are going to show a chart, keep it under cover until you are ready to display it. If you don't, the boys will read it and get a partially baked idea of its meaning. Their attention is distracted and they may even build up objections to it. If they see it for the first time when you display it and interpret it, then they get your position first. The greatest value of such props is the element of surprise; and by keeping it under cover, it will serve its maximum usefulness to you.
5. Have everything ready. Don't pass out an item, such as a pamphlet, and ask the boys to pass it around while you are discussing it. The noise and the competition you set up for yourself certainly do not help you gain the attention of your conferees. If you want to pass out some material, make it a part of your meeting. Give it to one of the men at the center of the conference table and make its distribution a part of your demonstration; or if you want to review some written material, have each man participate in the reading of the material. Don't send an assistant out in the audience to set up a projector while you go on with your phase of the meeting. Have your projector set up in advance, and your film tested and ready for immediate presentation. And we will repeat aagin, make sure your room can be darkened for the proper display of visual aids by projection, adequately and promptly.
6. Make sure you have sufficient seating facilities and that the ventilation is good and outside interference is at a minimum. Make sure all physical arrangements are such as to contribute to your meetings, rather than have some such item in competition with you for attention of your conferees.
7. Don't depreciate. When you set out to do a demonstration, don't say, "I don't know whether or not this will explain my point." Don't announce, "These charts were made up for another purpose, and I am not sure that they will show you what I want." Don't start, "If you will bear with me—." If you have any doubts about the interest - worth of your material, how can you expect the audience to believe anything? If you feel it doesn't make the point, discard it, or use it without comment. It is probably poor enough without your knocking it!
8. Place special exhibits at the back of the room. If you want the boys to examine models or parts after the meeting, put them at the back of the room near the exit. Don't put them up front for most of the boys want to run as soon as you are finished, anyway. And don't leave them back there unattended! Get back there quickly and call attention to them and answer questions about them.
9. Practice every demonstration. Never take a prop into a meeting until you have looked it over and know how it works, and know that you have mastered it. It may work with a simple flick of the wrist if you know how to flick! Never admit, "This is supposed

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to do so and so, but I never worked it before." If you have to demonstrate, practice until you have the demonstration letter perfect. Try it before a group only when you can make it look easy.

In conclusion—if you want your meeting to click, establish your objective, and adopt a carefully laid plan of presentation to meet this objective. Balance your plan with judicious use of conference development, statistics, demonstrations and the visual aids. Make your presentations interesting, timely and orderly. Don't use stilted terms, be considerate and understanding and demonstrate an air of willingness to get the other fellow's point of view. Be honest in your approach, lay your cards on the table, don't hedge. Be fair, state the problem accurately. Be firm in your position and assure you are supported by facts in such position. Make sure your conferees are in a harmonious state of mind for easy acceptance of your proposition. Recall "rapport" — make sure you have it, not only from the mental point of view, but from the physical as well. Create a desire for your product — "the accident proof job" and demonstrate your sincerity of purpose by a well-planned, interesting and purposeful meeting and I know you'll get the results desired and the record will take care of itself.

Presented at Annual Meeting, National Safety Council, Stevens Hotel, Chicago, week of October 6th, 1947.

New Safety Directory

A new Directory for 1948—covering the entire field of Safety, Fire Protection and Control, Hygiene, First-Aid and Sanitation—is now available to industry, as recently announced by the Alfred M. Best Company's Safety Engineering Division.

The Directory is unique in that it combines all the best practical features of a Safety Manual, Directory, Index, Encyclopedia and Catalog into one comprehensive, profusely illustrated, 494-page volume.

One outstanding feature of this book is its indexing and subject-grouping system. These devices—plus many illustrations—make it easy to locate safety products even when the user is not certain of the type or name of the product he needs. The logical arrangement of subjects also serves as a checklist of hazards—many of which are frequently overlooked.

The book is priced at $5.00—with lower rates for quantities. Either the Directory itself or complete information may now be obtained from Alfred M. Best Company, 75 Fulton Street, New York 7, N. Y.

Federal Power Commission

Philadelphia Gas Works Company Applies for Emergency Deliveries

The Philadelphia Gas Works Company has filed an application with the Federal Power Commission requesting an order directing Texas Eastern Transmission Corporation to make emergency deliveries of gas, beginning February 9, 1948, in such amounts as may be available up to 10,000,000 cubic feet per day for use in its manufactured gas plant in Philadelphia to replace oil as an enriching element.

The Philadelphia Company stated that an emergency has arisen as a result of a shortage of oil during this winter and that if natural gas is not supplied to the company as requested the population of the City of Philadelphia will be deprived of very substantial amounts of gas during the present winter season, both for domestic and industrial uses and may be confronted wtih a serious interruption in supply with consequent danger to the public health and in the impairment of industrial functions.

In its opinion and order of October 10, 1947, the Commission approved the delivery of gas to The Philadelphia Gas Works by Texas Eastern but limited deliveries prior to July 1, 1948, to such quantities as might be available over and above the quantities otherwise obligated under the order. At that time Philadelphia Gas Works believed it would not require natural gas before the fall of 1948. Subsequent to issuance of the order, the company stated that it has been unable to contract for the required amounts of oil to be used in manufacturing the gas distributed in Philadelphia. It now estimates that it will be at least 5,000,000 gallons of oil short by March 31 of this year. The amount of gas requested would be used to make up this deficiency.

The Ohio Fuel Gas Co.

The Federal Power Commission has authorized The Ohio Fuel Gas Company to construct facilities for use in developing additional underground storage capacity for receipt into storage of an additional supply of natural gas from Texas, Oklahoma, Kansas, Louisiana, West Virginia and Kentucky. Such gas would be stored during the summer months and withdrawn during the winter months to meet requirements of the company's existing markets and consumers in major central and northwestern Ohio markets.

The Commission's order authorizes the company to:

1. Construct a natural gas compressor station in Monroe Township, Ohio to serve as a repressuring station for the company's Perrysville storage area. Installed capacity of the new station would be five compressor units totaling 6,350 horsepower, which units would be moved from Treat and Pavonia stations. When the Monroe station is completed the existing Perrysville station and a portion of the Brown station will no longer be required and will be retired.

2. Construct about 22 miles of 16-inch gas transmission line in Knox and Richland Counties, Ohio extending from Brown compressor station to the Monroe station and on to Pavonia station. Completion of this line would permit removal of about 39½ miles of smaller diameter lines.

3. Extend the present Perrysville storage area by the addition of 13 partially depleted producing wells, thereby creating an additional estimated storage capacity of one and a half billion cubic feet of natural gas. Present well and gathering lines would be replaced to withstand increased pressures.

Southern Natural Gas Co.

The Federal Power Commission has made public an order authorizing Southern Natural Gas Company to construct and operate facilities to increase the capacity of its main natural-gas transmission pipeline to 384,500,000 cubic feet a day and to serve several new markets in Mississippi and Alabama. Cost of the construction has been estimated at $12,296,610.

The 1947-48 construction authorized by the Commission consists of the addition of compressor units aggregating 9,000 horsepower to existing main-line compressor stations, about 130 miles of 24- and 20-inch main-line loops, a 2,000-horsepower branch line compressor station; 33 miles of 12¾ inch line to loop the present branch line to Gadsden, Alabama; extensions to Lexington, Mississippi and to White Plains, Alabama; a main-line connection for Tallasee, Alabama; and facilities to increase operating pressures on the Macon, Georgia and Montgomery, Alabama branch lines. The extension to White Plains will connect with lines extending to Jacksonville and Piedmont, Alabama, which lines are to be constructed by the respective towns.

Detailed Report Available on Fischer-Tropsch Process

A detailed account of the development and use of the Fischer-Tropsch process for producing synthetic fuels and lubricants as revealed by Dr. Otto Roelan, foremost German authority on the subject, is contained in a report now available through the U. S. Department of Commerce.

Photostat copies of the 67-page report (PB-77705 *Interrogation of Dr. Otto Roelen of Ruhrchemie A. G.*) sell for $5. Microfilm copies are $2. Orders should be addressed to the Office of Technical Services, Department of Commerce, Washington 25, D. C., and should be accompanied by check or money order, payable to the Treasurer of the United States.

Mimeographed copies of the report may also be purchased from the Hobart Publishing Co., Washington 15, D. C., at $4 a copy.

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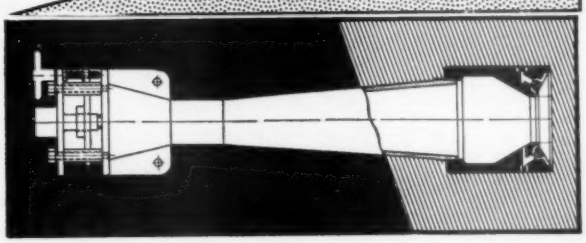

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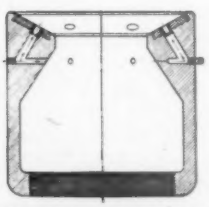

Section through "AIROCOOL" Nozzle showing igniter port, recessed gas tips and gas pilot.

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Recent Court Decisions
Affecting Gas Utilities

How to Win Gas Explosion Damage Suits

By
Leo T. Parker
Attorney at Law
Cincinnati, Ohio

RECENTLY a reader wrote a letter in which he wanted to know how officials of gas companies can prepare to win damage suits filed by consumers injured through gas explosions. This reader in part said: "In the past three years we have had seven suits for damages filed by persons injured by gas explosions in their own homes. Because of the frequence of these kind of suits please lay down a few rules to enable us to win these nuisance suits. Up to now we have lost almost all of these suits with heavy damage allowances awarded by juries and upheld by the higher courts."

The writer of this letter asked for information that will save his company many thousands of dollars. It is true that few officials of gas corporations realize that a few dollars spent in training employes what to do to prepare to win gas explosion damage suits will save the company many times the amount of this expense.

Duty to Observe

First, it is important to know that all higher courts are in accord with the legal proposition, as follows: "Every person is under a duty to exercise his senses and intelligence in order to avoid injury to others, and where a situation suggests investigation and inspection in order to avoid and eliminate dangers, the duty to make such investigation and inspection is imposed by law."

The best example of this legal rule is found in Golden v. National Utilities Company, 201 S. W. (2d) 292, reported June, 1947. We shall review this case in detail. Here are the facts: In June, a gas company received a complaint from a property owner that the gas pressure was low at 210 Main Street. The company's service superintendent went in response to the complaint and adjusted the stove burners. No test was made of the condition of the service pipe in from the gas main. On January 25, the property owner again complained. In response to that complaint the superintendent dug up six or eight feet of the approximately 45 feet of the service pipe in to 210 Main Street. The six or eight feet excavated were between the sidewalk and curbing in front of the house. It was stopped up, corroded, rusted out, and, being unfit for use, was removed and replaced with new pipe. There was a leak in that pipe. The superintendent did not know of the condition of the remainder of the service pipe on into the house but the remainder of the service pipe was neither excavated for examination, nor checked for leaks by pressure tests, or otherwise. The gas pipes had been laid more than forty years, were wrought iron and subject to corrosion and rust. Six months later the property owner noticed that the water heater and the oven of the stove would flash out or puff when any attempt was made to light them. One day the property owner's wife went to the basement to light the gas water heater. She lighted a match about the time she reached the bottom of the basement stairs. A loud explosion occurred accompanied by sudden flash and a burning ball of fire reaching 40 feet high into the tree in front of the house. She was severely burned.

The injured woman sued the gas company for damages and proved that a later excavation between the sidewalk and the curbing and only eight or ten inches nearer the house than that six or eight foot portion the superintendent had replaced, developed and that there was a large hole in that portion of the service pipe. Also, the soil around the pipe along the entire service line to the basement wall of 210 Main Street was a bluish gray indicating escaped gas. The injured woman contended that the company was liable primarily because the superintendent had failed to exercise his "senses and intelligence" when he failed to investigate and know that the balance of the service pipe was defective when he dug up six or eight feet of the pipe and found that it was defective and dangerous.

The higher court agreed with this contention and approved a jury's award for $8,000 damages. This court said:

"How far could appellant (gas company) ignore its responsibility in the transportation and handling of such a commodity? It knew that complaints of low gas pressure had twice come from 210 Main Street, which could have and should have suggested line leaks. On neither of such occasions were any line tests made. It knew that its pipes, subject to rust and corrosion, had been in the ground there for over 40 years, and that in that time much of its pipe had so rusted out. . . . There was a duty on appellant (gas company) to find out whether gas was escaping from other parts of the service pipes, but instead of making further examination appellant was content to excavate and replace only six or eight feet of the service line."

Hence, in this case the gas company could have saved the $8,000 damage award, plus approximately $1,500 expense in defending the damage suit, *if* the superintendent who dug up the six or eight feet of defective service pipe had dug up and replaced the balance of the defective service pipe. In fact the court clearly indicated that since the gas company's superintendent had dug up and found a portion of the service pipe defective it was his legal duty to dig up and replace the balance of the defective pipe.

Obviously, if the gas company had placed the obligation and duty on the property owner to dig up and replace

his defective service pipe then, under these circumstances, there could have been no liability on the gas company for injuries resulting from the explosion. But the instant the gas company's superintendent assumed the responsibility and duty to dig up, inspect and replace *a portion* of the defective service pipe, the legal duty automatically devolved on him to *eliminate* the cause of the subsequent explosion.

Notice Implied

The fact that gas company's officials or employes have no knowledge that a dangerous situation exists will not always relieve the company from liability for an explosion. In other words, all courts *imply* that a gas company had "notice" of a dangerous situation if the testimony shows that circumstances were such that the average prudent and reasonably careful person would have taken advantage of the "notice" and remedied the dangerous condition.

For illustration, in Guthrie v. City of St. Charles, 152 S. W. (2d) 91. In respect to the gas explosion this court said:

"If a defendant (gas company) in the exercise of ordinary care should have known the situation was unsafe and that some injury was likely to result he is dutybound to fend against it."

And again in Weed v. American Company, 14 S. W. (2d) 652, 655, the court held that a notice of danger is regarded in law as actual when the gas company's employes know of its existence, or is conscious of having the means of knowing it, although he may not employ the means in his possession for the purpose of gaining further information. Actual notice often means knowledge of facts and circumstances sufficiently pertinent in character to enable reasonably cautious and prudent persons to investigate and to ascertain the ultimate fact.

In Ruling Case Law, pages 346-347, it is said: "Whatever fairly puts a person on inquiry is sufficient 'notice,' where the means of knowledge are at hand and if he omits to inquire, he is then chargeable with all the facts which, by a proper inquiry, he might have ascertained. This, in effect, means that 'notice' of facts which would lead an *ordinarily prudent man* to make an examination and discover a dangerous condition is the same value, as far as effective testimony is concerned, as whether the person injured by a gas explosion proves that a gas company official or employe knew that the dangerous condition existed and failed to either remedy it, or notify the consumer of the dangerous condition."

For illustration, in Nomath Hotel Company v. Kansas City Gas Company, 253 S. W. 975, the testimony proved that prior to a gas explosion in a hotel there had been no notice to the gas company that there was any gas leaking into or suspected of leaking into the building. However, the testimony showed that three weeks prior to the explosion there was a gas fire in the street nearby caused by gas from a broken main.

The court held that such street fire from a broken main "was notice thereof to the gas company three weeks before the explosion." Hence the gas company was held liable in damages for the explosion because the gas company's employes failed and neglected to dig up and replace the broken main and connecting pipes at the time the street fire occurred.

So, therefore, officials of gas companies may very well prepare to avoid and win law suits for gas explosions by instructing all employes to take "notice" of a situation that may result in an explosion of gas, and immediately report, repair and eliminate the dangerous condition.

Actual Notice

Another important point of law is that a jury may decide that a gas company had "actual notice" of a defect that caused an explosion of gas, whereby the gas company is liable in damages.

For illustration, in Hodges v. Atlanta Gas Light Company, 42 S. E. (2d) 244, reported July, 1947, it was shown that a gas company sold and installed gas appliances, including gas heating home furnaces. The company contracted to install and connect a gas furnace in a home.

The company's employes did connect the furnace, including the thermocouple, thermostat, and other necessary gas appurtenances and connections. Thereafter, from time to time the company's employes were called in to do work and make adjustments on the furnace and its parts. At no time since the furnace was installed in the house has anyone except the gas company's employes done any work of any sort on it, nor have any adjustments been made by any one except the company's agents.

The furnace exploded and the property owner sued the gas company for damages. The court held that the jury could listen to the testimony and decide whether the gas

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company "had actual knowledge of the defective condition of the furnace and its controls."

Must Prove Negligence

Basically a gas company never is liable for damages caused by explosion of gas, unless the testimony proves that negligence of the gas company's officials or employes caused the explosion.

For example, in Kinderknecht v. Hensley, 164 Pac. (2d) 105, reported January, 1947, the testimony showed that a property owner smelled gas and notified the company. The company's employe discovered a leak in the service pipe leading into the meter in the basement. Soon after the employe entered the basement a violent explosion occurred, and severely burned the property owner and the building. The property owner sued the company for damages and alleged that the company's employe negligently, carelessly and recklessly ignited the gas fumes in the basement. However, the property owner failed to prove these allegations and the higher court refused to hold the company liable. This court said:

"It must be conceded that the mere fact an accident—in this case an explosion—occurs and injury results is not sufficient to establish liability. It is elementary law that before a plaintiff (property owner) can recover upon negligence he must both allege and prove the negligence of the defendant (company) which was the proximate cause of the injury for which recovery is sought."

Thus, the higher court refused to hold the company liable in damages because the property owner failed to prove that the explosion was caused by negligence of the company's employe.

A careful review of late and leading higher court decisions discloses law, as follows: A gas company will not be held liable in damages for an explosion of gas (1) unless definite proof shows that negligence of its employe caused the explosion; (2) the mere fact an accident occurs and injury results is not sufficient to establish liability; and (3) before a property owner can recover in a suit, he must both allege and prove the negligence which was the proximate cause of the injury for which recovery is sought.

Property Owner Negligent

According to a recent higher court a gas company may avoid all liability for an explosion of gas by proving that the owner of the damaged property, or consumer, had knowledge of the dangerous condition and continued to use gas in the building. Under these circumstances the court will decide that the consumer was contributory negligent which evidence always relieves the gas company from liability.

For instance, in Jelf v. Cottonwood Falls Gas Company, Inc., 178 Pac. (2d) 992, reported July 1947, it was shown that a property owner had knowledge of the escaping gas for a period of approximately six weeks prior to the explosion.

The higher court held the gas company not liable saying that a gas consumer is contributory negligent if he continues to use natural gas in a building after knowing that gas is escaping into the house.

Cooling Unit for Home and Commercial Use

Payne Furnace Company, Beverly Hills, Calif., has announced its re-entry into the field of evaporative cooling with a new 1948 model "CoolerAir" for home and commercial cooling, which is said to include 14 major innovations and special features, one of which is a new-type "Fiberglas" evaporative filter.

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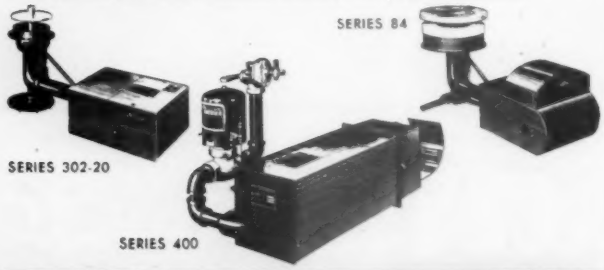

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U. S. Mineral Production in 1947

THE TOTAL VALUE of minerals and mineral products produced in the United States and Alaska in 1947 reached an all-time peak of $12,400,000,000, exceeding the former record of 1946 by 40 percent, Secretary of the Interior J. A. Krug announced in January. The 1946 figure was $8,859,000,000.

A new high in the physical volume of production also accompanied the increase in dollar value, the Secretary stated. On the basis of preliminary estimates prepared by the Bureau of Mines, the total *quantity* of minerals produced was approximately 5 percent over the previous peak output recorded in 1944, and about 13 percent over the 1946 production.

Last year's mineral production of performance is evidence of the efficiency and vitality of American mineral industries and of the ability of our natural resources to contribute vast quantities of the important sinews of war and peace, Secretary Krug commented. However, he cautioned that the Nation should not lose sight of the fact that mineral deposits are exhaustible, and that the rate of discovery in the United States is not keeping pace with the rapidly rising output.

Current production of petroleum, for example, is approximating the maximum rate at which our developed reserves can be worked efficiently. The production of copper, lead and zinc in 1947 — metals which before the war we produced in sufficient quantities to meet virtually all our own needs—was considerably below previous peaks and substantially below domestic requirements so that large imports were required. These simple facts emphasize the need for vigorous national action to promote all practical conservational measures, to stimulate the search for additional domestic deposits, and to assure adequate supplies from abroad of those minerals that cannot be produced at home in sufficient quantities to meet our needs, the Secretary added.

Achievement of the 1947 record value of production resulted predominantly from higher commodity prices, according to the analysis submitted to James Boyd, Bureau Director, by the Economics and Statistics Division. Approximately a third of the rise in value, however, was due specifically to *increased tonnages* produced—a consequence of unprecedented peacetime demands by industry and agriculture and of labor-management tranquility that permitted almost full-time operations.

Mineral Fuels

Total value of mineral fuels in 1947 was $7,800,000,000 compared with $5,725,000,000 in 1946—an increase of 36 percent.

Petroleum. Production of crude petroleum reached a record in 1947 estimated at 1,855 million barrels—an increase of 7 percent over 1946. The estimated value at the well was $3,599,000,000, an average of $1.94 per barrel.

Demand (sales) for all oils (domestic and export) in 1947 totaled 2,142 million barrels, a gain of more than 10 percent over 1946. Sales showed a relatively greater increase than crude production as a result of an increase of some 22 million barrels in imports; a small increase in stocks that was about 42 million barrels less than in 1946; and a gain of 15 million barrels in the production of liquid products from natural gas.

Exports of all oils were estimated at 164 million barrels compared with 151 million barrels in 1946, so it is apparent that the major increase in demand was domestic. Total demand (sales) of motor fuel was up 7 percent and fuel oil 12 percent.

Natural Gas. The marketed production of natural gas in 1947 increased almost 10 percent over the 1946 total to a new record of 4,400 billion cubic feet valued at points of consumption at approximately $1,015,000,000. Demand was stimulated by the improved economic position of natural gas relative to competitive fuels and by the high level of business activity and national income.

Insistent demand for natural gasoline for blending into motor fuel and for liquefied petroleum gases for domestic and industrial purposes resulted in a 14 percent

NATURAL GAS RESERVES†

TABLE I—RESERVES IN UNITED STATES (Millions Cubic Feet)
Year 1946

Province State	Reserves 12-31-45	Reserves Added by Discoveries, Extensions, Etc.	Production	Net Change of Reserves 12-31-45	Reserves on 12-31-46
Appalachian					
Kentucky	1,436,800	44,200	95,000	50,800*	1,386,000
New York	76,000	1,900	7,000	6,100*	69,900
Ohio	626,800	46,200	59,000	12,800*	614,000
Pennsylvania	520,000	61,000	78,000	17,000*	503,000
W. Virginia	1,928,300	116,700	205,000	88,300*	1,840,000
Total	4,587,900	269,000	444,000	175,000*	4,412,900
**Decrease*					
Southwestern					
Kansas	13,250,605	636,771	206,532	430,239	13,680,844
Louisiana	19,849,393	3,170,050	607,932	2,562,118	22,411,511
Oklahoma	10,079,938	1,311,816	655,908	655,908	10,735,846
Texas	78,306,676	10,154,021	2,097,238	8,056,783	86,363,459
Total	121,486,612	15,272,658	3,567,610	11,705,048	133,191,659
All Other States	21,714,855	2,187,494	951,007	1,256,487	22,971,342
GRAND TOTAL	147,789,367	17,729,152	4,942,617	12,786,535	160,575,902

TABLE II

RESERVES AND YEARS REMAINING AT 1946 RATES OF PRODUCTION
(RESERVES AND PRODUCTION—MILLIONS CUBIC FEET)

	Reserves On 12-31-46	Production Year 1946	Equivalent Years Remaining
Appalachian			
Kentucky	1,386,000	95,000	14.6
New York	69,900	7,000	10.0
Ohio	614,000	59,000	10.4
Pennsylvania	503,000	78,000	6.4
West Virginia	1,840,000	205,000	9.0
Total	4,412,900	444,000	9.9
Southwestern			
Kansas	13,680,844	206,532	66.2
Louisiana	22,411,511	607,932	36.7
Oklahoma	10,735,846	655,908	16.4
Texas	86,363,459	2,097,238	41.2
Total	133,191,659	3,567,610	37.3
All Other U. S.	22,971,342	931,007	24.7
GRAND TOTAL	160,575,902	4,942,617	32.5

† *American Gas Association.*

production increase in 1947 over 1946. The output, establishing a new record, was about 5,534 million gallons valued at the plants at $322,000,000. Production of native asphalt rose about 10 percent.

Bituminous Coal. Production of bituminous coal and lignite in 1945 was estimated at 618,000,000 net tons, an increase of 16 percent over the output of 533,922,068 tons in 1946. The increased production is attributable to the heavy demand throughout the year and the fact that there were fewer and shorter strikes than in the past year. The estimated loss of production due to strikes in 1947 was 19,000,000 tons compared to 107,000,000 tons in 1946, computed at the going rate of production immediately prior to the strikes.

The average value per net ton at the mine for soft coal in 1947 was $4.00—an increase of 16 percent over $3.44 in 1946. This increased value is the highest on record.

Pennsylvania Anthracite. Production of Pennsylvania anthracite in 1947 was estimated at 57,000,000 net tons, a decline of 6 percent from the 60,507,000 tons produced in 1946. The decline in output can be attributed primarily to slack working time in many mines during the summer, when many consumers failed to follow the usual custom of purchasing a substantial part of their winter requirements. The estimated value of the 1947 production at the mine was $430,000,000.

Coke. The production of beehive and oven coke in 1947, estimated at 72,800,000 net tons, was the highest ever attained in a peacetime year and was slightly less than the record output of 74,038,000 tons in 1944. Although oven-coke production increased 23 percent over 1946, there was a scarcity of metallurgical coke and a number of beehive plants that had suspended operations in 1945 and 1946 were reactivated in 1947, increasing the output of beehive coke 44 percent over 1946.

The total values of coke and coal chemical materials at producing plants in 1947 were estimated at $800,000,000 and $200,000,000, respectively, 64 and 27 percent above the 1946 figures.

Bureau of Mines Information Service

Acetylene from Methane

Production of acetylene from methane in a German-designed regenerative type furnace is described in a report now on sale by the Office of Technical Services, Department of Commerce.

The report contains information on a process worked out in Germany by Ruhr-Chemie engineers which utilizes methane as a raw material.

Mimeographed copies of the 50-page report (PB-80331; *The production of acetylene from methane in a regenerative type furnace*) sell for $1.50. Orders should be addressed to the Office of Technical Services, Department of Commerce, Washington 25, D. C., and should be accompanied by check or money order payable to the Treasurer of the United States.

GAS STATISTICS FOR 1947—AMERICAN GAS ASSN.

ALL TYPES OF GAS (Preliminary Estimates)

CUSTOMERS	1947	1946	% Change
Total	21,590,000	20,928,000	+ 3.2
Residential	20,086,000	19,484,000	+ 3.1
Commercial	1,397,000	1,340,000	+ 4.3
Industrial	92,000	89,000	+ 3.4
other	15,000	15,000	— —
Total	$1,407,561,000	$1,211,262,000	+16.2
Residential	885,182,000	761,274,000	+16.3
Commercial	183,702,000	153,781,000	+19.5
Industrial	329,314,000	284,317,000	+15.8
other	9,363,000	11,890,000	— —

NATURAL GAS (Preliminary Estimates)

CUSTOMERS	1947	1946	% Change
Total	10,268,000	9,582,000	+ 7.2
Residential	9,500,000	8,859,000	+ 7.2
Commercial	725,000	680,000	+ 6.6
Industrial	37,000	37,000	+ 0.0
other	6,000	6,000	— —
SALES (MCF)			
Total	2,503,637,000	2,194,948,000	+14.1
Residential	745,583,000	606,128,000	+23.0
Commercial	225,352,000	183,368,000	+22.9
Industrial	1,504,911,000	1,354,560,000	+11.1
other	27,790,000	50,892,000	— —
REVENUES			
Total	$ 855,185,000	$ 712,804,000	+20.0
Residential	473,053,000	386,606,000	+22.4
Commercial	104,070,000	82,858,000	+25.6
Industrial	272,417,000	235,201,000	+15.8
other	5,646,000	8,139,000	— —

MANUFACTURED GAS (Preliminary Estimates)

CUSTOMERS	1947	1946	% Change
Total	8,776,000	8,799,000	— 0.3
Residential	8,200,000	8,230,000	— 0.4
Commercial	530,000	524,000	+ 1.1
Industrial	39,000	38,000	+ 2.6
other	7,000	7,000	— —
SALES—MCF			
Total	439,233,000	405,342,000	+ 8.4
Residential	295,468,000	272,797,000	+ 8.3
Commercial	68,332,000	62,571,000	+ 9.2
Industrial	71,043,000	65,259,000	+ 8.9
other	4,390,000	4,715,000	— —
REVENUES			
Total	$419,064,000	$381,748,000	+ 9.8
Residential	312,060,000	286,774,000	+ 8.8
Commercial	62,020,000	55,837,000	+11.1
Industrial	42,099,000	36,149,000	+16.5
other	2,884,000	2,988,000	— —

MIXED GAS (Preliminary Estimates)

CUSTOMERS	1947	1946	% Change
Total	2,374,000	2,423,000	— 2.0
Residential	2,230,000	2,283,000	— 2.3
Commercial	127,000	124,000	+ 2.4
Industrial	15,000	14,000	+ 7.1
other	2,000	2,000	— —
SALES—MCF			
Total	176,286,000	148,547,000	+18.7
Residential	118,895,000	99,179,000	+19.9
Commercial	24,782,000	21,061,000	+17.7
Industrial	31,090,000	26,978,000	+15.2
other	1,519,000	1,329,000	— —
REVENUES			
Total	$124,712,000	$110,625,000	+12.7
Residential	94,069,000	83,636,000	+12.5
Commercial	15,312,000	13,529,000	+13.2
Industrial	14,598,000	12,835,000	+13.7
other	733,000	625,000	— —

Trends In Communicating With Employees

By

Howard A. Marple

Assistant Director of Advertising
Monsanto Chemical Co.
St. Louis, Mo.

Management-Employee Relations in these times is a subject much discussed. In this paper, presented at the A.G.A. Employee Relations Conference, Dallas, Nov. 20th, 1947, Mr. Marple analyzes the state of mind of the average employee and what he wants to know about the affairs of the company he is connected with. He gives pertinent reasons why management should meet the reasonable demands of employes for such information, for the mutual benefit of all.—Ed.

MEN, at all times, have tried to understand one another. From the earlist dawn of history—and before history began—men have tried to establish a channel of communication—a bridge between minds. It is a fundamental need . . . this hunger to share ideas . . . it is a basic appetite in a social and sociable animal.

Men have tried to establish this clear channel of communications between members of society for two purposes—Pleasure and Profit.

Pleasure and profit—remember those two words. They are the motives that powered all our literature, our science, music, and art. Pleasure and profit!—They are the forces that have driven forward human progress itself. And fundamental as they are, these same motives are behind our personnel relations.

Today—the trend in our country is toward collectivism. This is odd in a country which was built up on individualism.

We are seeing more of it everyday—a general tendency to band together for security, the herd instinct becoming rampant.

There is nothing wrong with a desire for security—we all have it. But the peculiar part of the trend is the *means* we seek to obtain security. Why have so many people, labor organizations, political groups, whole nations suddenly come to feel that they are helpless alone—that there is only safety in numbers? What has happened to the daring, the independence? For what reasons do people want to surrender liberty and potentially rich rewards of *personal* achievement in return for handouts whose only attraction is that they are dependable.

My grandfather lived in Maine. He wanted security, too, but he was not a collectivist. He looked only to his own talents and ability for the things he wanted out of life. He built wooden sailing ships—he ran an insurance business—he was justice of the peace. . . . He used ships he had built for trade runs and brought back products that were needed up and down the coast. He looked to no man for help—he shared neither his profits nor his labor. And while he might have had more of his share of daring—it would have been fatal to such a temperament if it had to exist in an environment where there was no chances for gain through individual initiative.

We who resist throwing our independence overboard, who are trying to protect the gains of individual enterprise and to hold the political door open so that there can be *more* individual enterprise—we see the danger. In collectivism, we see that to set up a blanket, mass protection it will be necessary to smother leadership, that we will create an enervating environment—the antithesis of the environment that made this country grow into the world's greatest nation—from a rugged wilderness to the highest standard of living on earth—in 171 years!

And we who resist collectivism—we see the danger. We are trying to find a means of communication, a broader highway of understanding with the mass of people who make up the vague general terms: the public, labor, or more particularly, our own company's personnel.

The craftsmanship of writing and the art of illustration and the application of psychology through the use of printed words offers such a means of communication. The use of magzines, booklets, newspapers, leaflets of all kinds has developed comparatively recently. The effectiveness of such printed media has come a long way—but the road ahead is longer than the road behind.

It takes conferences and meetings such as this to tally up the balance sheet. We have to examine how far we have come and how far we have to go. We have to strike a trial balance and consider, first, *what* we have to communicate and, second, *how* we can communicate it.

By deciding on the content of our message and the means by which we will broadcast it—industry is becoming more articulate. Industry and business is finding its voice—through industrial publications, press releases, special reports, and advertising. Industry is developing the *capacity* for communication, using dividend leaflets with special messages, company movies, bulletins, letters to employees. It is necessary and it is commendable that we get together from time to time—to consider what vehicles shall carry the messages most effectively and what the messages shall be about.

The vehicles are the problem of the editors and the graphic arts. What we shall communicate, what information we will share is the problem of the policy makers, the management, the personnel men, the public relations executives. The content of our printed communications is determined by common sense psychology, fortified with a little analysis.

Our Economic Philosophy

First and foremost, because it stands at the fountainhead—we must be convinced in our own mind of the soundness of our economic philosophy. If we believe, and we should believe in free enterprise, this substitute phrase for capitalism, then our problem narrows down to sharing the information we possess that has led to our own convictions. We need only convey this information to those we hope to lead to the same conclusions. Complete knowledge, the logical deduction from all the facts is the most potent weapon against those who seek to destroy our system.

Misinformation is dangerous. If George Hammerhard, the successor to Joe Doakes and John Doe, thinks American capital gathers to itself 60% of the profit—he's got a right

to be mad. If he thinks twenty-five people own a 500 million dollar enterprise—it is logical for him to ask —where's my share? His resentment festers—and he's good hunting for agitators.

But it isn't necessary to wave a redder flag or beat a bigger drum. We can spike the guns of the opposition with the facts—the truth of the matter—that capital takes less out of most businesses than the interest rate George Hammerhard pays on his personal loans. Let him know that Capital is not ten bloated magnates, heartlessly clipping coupons.

Tell him that the "C" in "Capital" is *Charlie Jones* who works at the next machine. The "A" *anybody* with ten, fifty, or a hundred dollars to invest. The "P" in capital is people, little people, on farms, in apartments, in flats in the next block —people anywhere. Tell him the "I" is you or me and that we will get back on our investment just exactly what the business brings in. "T" is for the *twelve*—and the twelve is twelve thousand stockholders who own one of the smaller steel companies. Show George that the "A" is Aunt Harriet's insurance policy that will protect her old age. And tell him the "L" is *labor* who are gainfully employed, skillfully directed, and provided with the most ingenious tools the world has ever seen. And then tell him the end of the word, Capital is the beginning of labor who individually can save by investing in industry and earn *exactly* the same return as any other investor.

Tell him the story over and over in different ways, in the magazines, the newspapers and bulletins. Stay on the theme—as hard as the labor papers play the heavy largo under every item they print. Tell it in movies, leaflets, and bulletins. Sell the idea like we sell products, knowing that only one advertisement at a time is like shooting one arrow in the air. It takes shaft after shaft directed right at the target.

This is just the beginning of the *what* and the *how*.

Just recognize that it is in essence *sharing* information, telling the story repeatedly, and not hiding its meaning in a page of statistics, 6-point type, or an anagram.

Perhaps you might say—*why* should we go to such lengths? Why is there today a need for such intensive communication? Instead of spending energy in this way—let's wait for the return of *normal* times. In my father and grandfather's time, there wasn't any need for this abortive effort.

The answer to that is obvious. The need for it has grown out of the over-all change in American business itself.

In our grandfather's lifetime, business and the embryonic beginning of today's industry were small and personal affairs. Owners and managers were often the same person. Owners and managers worked in the same room or at least in the same building. Purchasing, manufacturing, selling and accounting, brushed elbows; sent out to the same saloon for a bottle of beer. The entire "personnel" of a business enterprise usually numbered less than some of our present day management labor committees.

Today, industry has come of age. A single business may have several plants, widely separated. It may have executive offices in another city, it has sales offices all over the country. Is it any wonder that knowledge of the company's operations is difficult to share with the personnel? But every one of the human beings who eight hours a day make up the *"personnel"* of a business and twenty-four hours a day make up this *public* we are trying to reach—each one is curious about what is going on. He wants to know not only out of curiosity, but because his personal interests are involved. He wants to know how it fares topsides—how the business is going. He wants to be satisfied that everything that management can do for the business and for his own welfare, in particular, is being done. It is because now, he is far away from the mainsprings—and the unknown breeds distrust.

What Employees Want to Know

This brings us to the part—*what* does the public and that part of the public who are company employees want to know about business?

This information can be classified into three broad categories.

The employees and the public want to know anything that affects their happiness, their physical selves, or their pocket book. Political philosophies, trends in government that affect the way of life, interpretations of law that apply to the personnel who make up a business—these are matters that affect an individual's happiness.

Employees want to know about economic trends, planned expansion, new jobs, wage distribution—and anything proximate or remote that affects their pocketbook or the community's pocketbook. The trend is to *demand* such information.

In Particular

An employee wants to know about the company personnel and its organization. This interest is directly related to his pocketbook because the success of business depends on the company's leaders. The way these leaders function will make or mar the employee's own future.

An employee wants to know his company's history. All men have a love of tradition. It makes a man feel proud to have a sense of unity with the past and to feel a part of something that will project itself into the future.

An employee wants to know about labor policies. Not the information he can review in his copy of the union contract. He wants to know the *"why"* behind specific policies and the reason for their being.

The employee wants to know as much as he can be told about the company products, about the sources and the kinds of raw materials and the uses of the end products. If a product which he helps to make is an outstanding performer, that employee takes a share in the glory.

Management has some knowledge of things to come in the way of sales orders and distribution in the immediate and remote future. A company's management buys this information, in the form of market surveys, analyses of business trends—new businesses are watched with an eye to new orders. This information is of importance to an employee, he can see himself in the center of an active body, a company that is awake and keeping its eye on the future.

Employees want to know about research—about what has been discovered in the field, what fields are being investigated, what new applications are being tried. An employee wants to know if there are new products on the horizon—not to the extent of reviewing a progress report —but with reasonable promptness when the release of such information will not be a danger to his company.

And likewise—an employee is interested in the outlook of the industry as a whole. He is interested in taxation—to be acquainted with the obligations of his company, not only to the stockholders, but also to the government of his country.

The reasons *why* an employee wants to know these things are as simple as the reasons *why he should know them*.

An employee wants to know company personnel, its products, its finances, its outlook—because *he* de-

pends on that company for his financial security. He wants to know so that he can feel a part of the whole, not just a functioning unit but a personal segment of the enterprise, no matter how big, far flung, or seemingly remote from his particular interests. In short, such knowledge brings the employee into the fold, makes him see the problems faced by his management. It makes him feel that he is a necessary part of a team, a team organized to meet the production, the accounting, the sales, or the maintenance problems. Once admitted into the complete picture, he is no longer separated, apart. He has the answers. When agitators attack big business—they are attacking him.

Breed Confidence in Big Business

In these times, when doubts bred of uncertainty and fear make people listen to subversive propaganda—it is imperative that uncertainty about big business be abolished. Instead of vast, impalpable fears of the future—the American working man should be given enough information so that his outlook is one of confidence. He must know that his position in industry and business is only as safe as the position of industry and business itself. Business operates at a reasonable risk. And unless the working man chooses to assume a reasonable risk himself, he will take his chances on a sea of trial and error such as we see in countries all over the earth — *not one of which can boast of a past record, in any way comparable, to the history of democratic free enterprise.*

The Problem

This then is our problem: To point out the record to the working man and the general public. To acquire people with the organizations that exist today that can project the success story of the past into the future. It is now our job to "put a bear on the cave wall"—a warning that there is danger in the vicinity.

If this can be done, and we will talk about the *method* in just a minute, there are many benefits apparent almost at once. Factual information eliminates *"The Grapevine,"* that intangible gnawing that is begotten of an idle rumor, that grows like a many headed hydra as it passes from mouth to mouth.

Sharing company information points up that the employee's interests and management's interests are almost identical, that what benefits the business, benefits the employees. This knowledge pulls management and labor closer together, lessens the gap between the man who makes a part and the man who makes the *business* a part of a successful economic philosophy.

Method of Procedure

And now we come to the question. . . . How is this to be done?

It is doubtful whether any of us will hit upon an altogether new and unique method of communicating with employees. But the means that are now at hand have not reached their limit of effectiveness.

In the broad sense, the trend is toward deepening the present channels of communication and adopting some of the newer methods that are springing up all over the country.

One definitely healthy trend is the establishment of two-way channels of communication, from management to employees and back from employees to management. This may be in the form of employee opinion surveys or it may be establishing "gripe boxes" around the plants to receive unsigned employee complaints. No more certain sign can be found of management's recognition of the importance of public opinion than the establishment of whole departments to keep employees, communities, and the general public informed of com-

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More Popular Than Ever

With Home Owners and Dealers

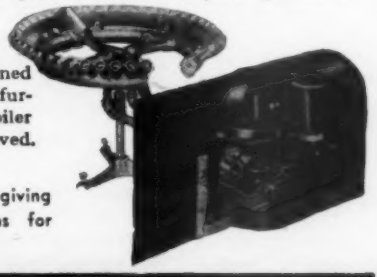
DEALERS SAY—Columbia Nutipe Burner has a common sense design. Closely duplicates operation of appliance when solid fuel was used. Easy to install. Seldom requires service.

HOME OWNERS SAY—Gives quick heat transfer and earlier delivery of heat to rooms. Has tamper-proof controls and quiet operation.

MODEL P-ZE

shown here is designed for use in warm air furnaces or round type boiler where grates are removed.

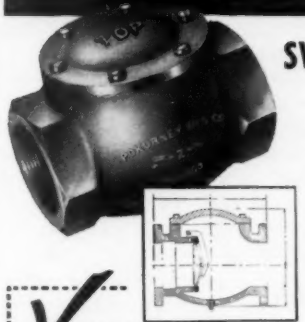
Send for free folder giving complete instructions for installing



THE COLUMBIA BURNER CO.

729 Ewing Street • Toledo 7, Ohio

POKORNEY



SWING CHECK VALVES

SERIES 3000

Specify Pokorney check valves for more efficient service on manufactured, natural or liquefied petroleum gas lines. Series 3000 valves are fitted with a synthetic rubber seat permanently molded to aluminum check disc. Provides a perfect seal against back flow... unaffected by liquefied petroleum gases or condensate. Special seat design and precision machining prevent sticking. Free action disc opens fully providing full flow thru valve with minimum resistance and negligible pressure drop. Size ½" to 6" available for immediate shipment from stock in bronze, aluminum and grey iron. Larger sizes on special order. Write for prices and bulletin today.

CHECK these Pokorney features:

- ☐ Soft seat, synthetic rubber permanently molded to disc.
- ☐ Tight seal against back flow.
- ☐ Non-sticking on minimum flow.
- ☐ Valve seat not affected by condensate or liquefied petroleum gases.
- ☐ Full flow, low maintenance, long service.

Pokorney valves are machined to strict tolerances. Every valve individually tested. Fully guaranteed.

SERVING THE GAS INDUSTRY FOR OVER 40 YEARS

POKORNEY MANUFACTURING COMPANY

3117 Clybourn Avenue, Chicago 18, Illinois

pany doings. The job of such departments is to keep the company's attitudes, contributions, and progress well publicized in trade, business, and general newspapers.

Perhaps no single element in communication will surpass in importance the employee newspaper or magazine. Industrial journalism, after many ups and downs, has carved itself a real and tangible place in the business of personnel relations. It can go ahead to even greater strength if the men who publish such papers and magazines appreciate their responsibility to their readers and to their country. From ephemeral beginnings, industrial journalism has grown until now its potential importance is being grasped—not only by management but by the editors themselves. The day is past when an employee publication can afford to waste money printing eyewash and tittle-tattle.

The competition is too fierce, the competing labor papers are too sharp. The editor whose sheet is Pablum set in type is doing his company a disservice. This strong statement holds for the scissors and paste editor, the apple polisher, and the self-glory publisher. There are real issues to be met, specific questions to answer, and a complicated story to tell. The deepest channel of information should be the employee newspaper or magazine. The interests of the working man we touched on a few minutes ago could well serve as an editorial policy—a skeleton on which to build a program of publication year after year. It takes many issues to tell the complete story and the story has to be told over and over. An industrial publication should meet the issues of labor policies, wages, company policy, and internal relations with a barrage of facts, and meet the issues head on.

The Company Magazine

Information should be presented forcefully, clearly, attractively. There was a time when I spoke to many groups about ways and means to sell management on the power of the industrial publication. Circumstances have changed now to the point where management itself is growing daily more conscious of the need for a medium by which to reach its people. Business and industry need to communicate ideas—for profit to themselves and for the welfare of the reader. More and more companies are recognizing that the company magazine can help to do this job.

The recognition grows out of a conviction that has had sad proof. The past several years have shown that a company magazine is a thin curtain to hide a shabby industrial and public relations policy. With changing social relationships and political flux—industry and business has been quick to see that a healthy employer-employee relationship is good business. Consequently, it devolves on the editor himself to grasp the extent of his influence, to accept the stature that the times, as much as his own efforts, have thrust upon him. Primarily, it is the industrial editor who must tell industry's side of the story with more "selling" power than its opposition—the labor and rag tag political press. If the trend is toward collectivism—then the voice of the resistance, those who believe in independence and individualism, that voice must not be shouted down. Capitalism and industry has the right to have its case presented as completely and with as much persuasion as that of its opposition. While a large section of the press has taken up the gauntlet on the side of industry and business, the voice on the doorstep is more powerful than the voice in the public square. Consequently the industrial editor and the company publication should point up the truths as they apply to a given segment of business.

It is not too much to expect that a company publication should carry its campaigns so effectively as to put the labor press on the defensive. All of us have seen statements in the labor press that were so far afield from the truth as to constitute a publishing blunder. We have seen such misinformation in print while back in our own files the truth of the matter waited editorial attention.

I do not want to become involved in more speech making on industrial journalism. We can leave it at what has been said—the company publication should be a reliable channel between the front office and the shop. This has been said before. But in the light of present conditions, the necessity is acute. The company publication should carry real issues and factual information. It should gain the confidence of its readers and should make the man in the plant a thousand miles away feel that he is a part of a going enterprise, that his interests are best served by the welfare of the business as a whole.

Use Reports to Stockholders

A second channel of communication is the stockholders report. Stockholders reports in their usual statistical form can generally only be understood by an accountant. But there is no law that prohibits a company from interpreting columns of figures into pictures, graphs and stories. Many companies have seen the stockholders report as an opportunity to get the story of business across—so that it is more than a profit and loss statement. With the proper handling—the stockholder's report becomes a human document—a yearly chapter of company history. "Reserve" can be interpreted as executive bonuses or as something for a rainy day. The figures in a stockholders report that indicate how much a company is putting back into the business, instead of tidbits for the opposition, can be red meat for a story showing that the company is shoring up its foundations.

A stockholder's report is capable of many interpretations—but it should be presented so that the *true* interpretation is at once apparent. There is no surer method of answering the questions *who owns big business and how much do the employees get*. Stockholders reports should be edited with the keenest attention to the intellectual level of the reader. Given the maximum clarity, the barest simplicity, and the most vivid presentation — stockholders reports are more than a legal obligation—they are direct rebuttal of communistic propaganda.

Other Channels

Another voice of industry is press releases to the public media of communication, the radio, the press, and the magazines. The factual doings of a company in its respective community are news. Through press releases, employees gain a little of the glory of the limelight. Besides the intangible benefits, there is the very real benefit—the knowledge that the company is moving, is active, is making the news. Through press releases, Management can bring home the facts that industry is an active force in a community.

Secure press space for employee achievements, it's a sure fire way to gain goodwill. By releasing the company news to employees just a little in advance of its appearance in the newspapers, employees gain more of the sense of being an inner part of the organization. Thus, news releases have both an external and an internal influence.

Another channel of reaching employees is through internal use of advertising. We are all of us aware that in our advertising we present the selling side of our products. In this glamorizing we have another valuable tool that can let a little glory into the factories, the plants, and the mills. There are many ways

of using advertising material—in the company publication, on bulletin boards posted in locker rooms or beside the time clock. The practice does a little more of the same thing as advance posting of press releases—it gives the employee a sense of belonging, a feeling of being a part of progressive enterprise. And it has a secondary effect—it gives the worker a glimpse of the forces of competition—showing him that production is only half of the job and that it takes power and organization to stay abreast of the field.

We can sum up this discussion quite briefly. The trend of the times is to give employees and the public full factual information about business and how it operates.

We can use the vehicles already at hand more effectively. We can get our own story across by the same method used by the collectivist press, the method which has been proved by our own advertising—to sell an idea by vivid presentation, by its appeal to logic and emotion, and by repeating it over and over again.

Gas Service Co., Kansas City Kansas Div., Promotes Range Sales, 18 Models on Display

A Gas Range Show was held by Gas Service Company in cooperation with the local appliance dealers in Kansas City, Kans., during the four-week period from November 24 to December 20.

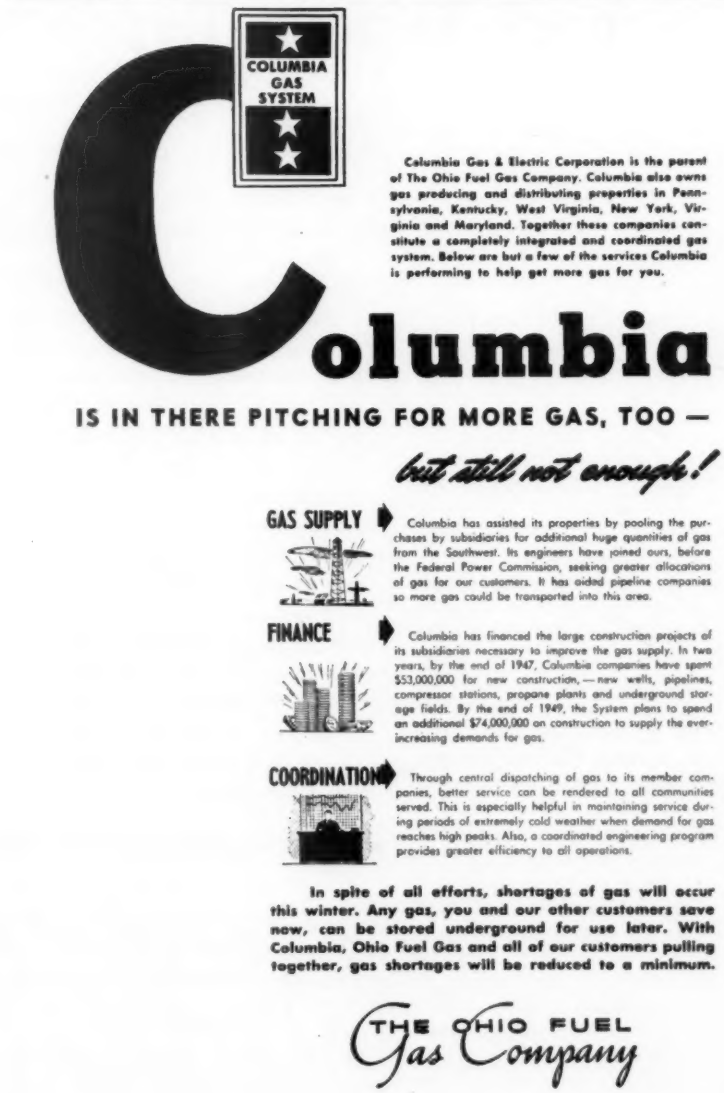
During this show eighteen different makes of ranges were displayed by the cooperating dealers on the Kansas City, Kans., division salesfloor.

Each range was set on a pastel shaded base with a mahogany and birch background; the name of the range and the dealer who was displaying it lettered above the range.

A different range was demonstrated by members of the Home Service Department each afternoon during the show. The show was given considerable advertising and publicity in the local paper with the makes of ranges and displaying dealer carried in the ads. Great interest in the display was shown by the public and a considerable number of range sales were made by the dealers, due directly to the show. A large printed sign was placed in a prominent place, listing all the local gas range dealers and all the makes of ranges they sell.

C. H. Waring, manager of the local company, extended greetings to the dealers and introduced R. R. Johnston, superintendent, E. A. Schuhmacher, office manager, and J. G. Tooker, new business manager, who in turn presented the members of the Home Service Department.

F. M. Rosenkrans, general new business manager of Gas Service Co., spoke to the dealers regarding the steps that have been taken to cooperate with them in the sale of gas appliances, and plans for the future. This talk was received by the guests with a great deal of interest and attention.


COLUMBIA GAS SYSTEM
Columbia Gas & Electric Corporation is the parent of The Ohio Fuel Gas Company. Columbia also owns gas producing and distributing properties in Pennsylvania, Kentucky, West Virginia, New York, Virginia and Maryland. Together these companies constitute a completely integrated and coordinated gas system. Below are but a few of the services Columbia is performing to help get more gas for you.
Columbia
IS IN THERE PITCHING FOR MORE GAS, TOO —
but still not enough!
GAS SUPPLY
Columbia has assisted its properties by pooling the purchases by subsidiaries for additional huge quantities of gas from the Southwest. Its engineers have joined ours, before the Federal Power Commission, seeking greater allocations of gas for our customers. It has aided pipeline companies so more gas could be transported into this area.
FINANCE
Columbia has financed the large construction projects of its subsidiaries necessary to improve the gas supply. In two years, by the end of 1947, Columbia companies have spent $53,000,000 for new construction,—new wells, pipelines, compressor stations, propane plants and underground storage fields. By the end of 1949, the System plans to spend an additional $74,000,000 on construction to supply the ever-increasing demands for gas.
COORDINATION
Through central dispatching of gas to its member companies, better service can be rendered to all communities served. This is especially helpful in maintaining service during periods of extremely cold weather when demand for gas reaches high peaks. Also, a coordinated engineering program provides greater efficiency to all operations.
In spite of all efforts, shortages of gas will occur this winter. Any gas, you and our other customers save now, can be stored underground for use later. With Columbia, Ohio Fuel Gas and all of our customers pulling together, gas shortages will be reduced to a minimum.
THE OHIO FUEL Gas Company

Through the medium of the daily newspapers in Ohio, The Ohio Fuel Gas Company and Columbia Gas & Electric Corporation acquaint the public in this forthright manner with present conditions and future plans.
The above copy, original size 4 columns wide by one foot high, is one of many used in Ohio dailies during January.

Promotions at De Laval

J. P. Stewart has been appointed manager of commercial and marine sales of the De Laval Steam Turbine Company, Trenton, New Jersey, it was announced January 1.

Mr. Stewart came with De Laval in 1946 to handle the sales of its centrifugal compressors, after seventeen years experience in engineering, production and sales.

H. G. Bauer, manager of the marine division of De Laval has been appointed executive engineer of the company.

Mr. Bauer joined the De Laval organization in 1937 after extensive marine engineering and shipbuilding experience in Europe and in this country. He received his technical education in Europe.

School Kitchen Replacement Plan

By
A. G. Bur

"We all know that a habit, a principle, or a preference is easily acquired as a child and is seldom forgotten," said A. G. Bur, Sales Manager, Wisconsin Public Service Corp., Green Bay, Wisconsin in his paper presented at the Home Service Breakfast during the A.G.A. annual meeting at Cleveland in October.

Modern equipment in the Home Economics Kitchens in the schools, he reasons, becomes therefore a mandate.

In his paper Mr. Bur outlines the plan and the successful results.—Ed.

AFTER three years of counseling with manufacturers, dealers and school authorities, my company, the Wisconsin Public Service Corporation, developed a plan for annual replacement of equipment in Home Economics kitchens. Our conclusions were that an annual replacement plan better suited the problem in our corner of Wisconsin than any other type of plan, and at the same time our calculations proved it to be the most economic from the standpoint of all concerned.

Studying the problem we found many important reasons why we as a utility company should take the leadership in establishing some form of modernization plan, whether it be annual or otherwise. There were ten important reasons that led us into an active campaign for modernization of teaching equipment early in 1946.

(1) We all know that a habit, a principle or a preference is easily acquired as a child and is seldom forgotten. This simple truth seemed to us to virtually constitute a mandate to always have modern equipment in our teaching institutions.

(2) Our experience with infrequent and irregular attempts at modernization proved to be inadequate.

(3) We realized also that if we didn't keep the teaching equipment in Homemaking Departments constantly up to date, competition would do the job for us.

(4) Children and teachers deserve the best and most modern equipment. We wouldn't expect them to use textbooks which were twenty or thirty years old, but I regretfully admit that gas ranges in a few of our schools fell in those age brackets.

(5) As many students as possible should have the opportunity to learn how to cook and otherwise keep house with modern appliances and to become familiar with the fuel we wish to sell. Perhaps more important, the ease and convenience of automatic gas cooking will show more students the virtues of cooking at home.

(6) We want the children to yearn for modern appliances; now in their parents' homes and later in their own homes.

(7) Modern equipment makes Home Economics instruction more popular—hence, Home Economics Departments will enlarge, particularly if the equipment is furnished economically.

(8) An economical modernization plan encourages small schools who do not now have Homemaking Departments to establish such departments.

(9) Manufacturers, jobbers and dealers deserve local leadership in bringing to our schools the best equipment in their lines.

(10) A modernization plan which frequently brings equipment up to date provides increased contact opportunities for our Home Service personnel.

Our contacts with Home Economics teachers and school authorities were greatly simplified by the preparation of a question and aswer booklet which also contains sample contracts. If anyone cares for a copy of this booklet, you can write to my company at Green Bay, Wisconsin, for a copy.

Details of Plan

In substance, the plan offers appliances to the schools, to be used only for class instruction, at 50% of the regular retail selling price with the understanding that every year thereafter each appliance will be replaced without any cost whatsoever to the school. The dealers are given equal opportunity to participate in the plan and the schools have complete freedom of choice in the selection of brands of equipment. The greater majority of manufacturers have cooperated by allowing a larger discount on equipment to be used for school instruction purposes. In general, the additional allowance has been somewhere in the neighborhood of 10%.

Another factor which helps the economics of the plan is that the schools are exempt from the manufacturers' excise tax and in placing their orders for ranges and other equipment they file exemption affidavits. This contributes another sizable amount to the right side of the ledger in making the plan economically sound.

The contract with the school is generally written for a period of four to ten years, although it can be cancelled at any time the school wishes to do so. A similar contract is made with the dealer, under which he furnishes the equipment to us at approximately 50% of the retail price and we, in turn, bill the school and connect the appliances to the piping facilities furnished by the school. Irrespective of the brand or brands of appliances chosen by the school, the school looks to us entirely for the continuity of the plan. We make the arrangements each year to provide the equipment, whether it comes from our own stores or through dealers.

After the close of each school year the old equipment is taken out and the new equipment is connected before the opening of the fall term. We have found that teachers and other school employees are most anxious to buy the removed equipment, which is less than a year old and usually well taken care of. During the present market situation our experience is that this equipment can be resold at a price not less than 85% of its retail value. In ordinary times we believe an appliance ten months old will always bring 75% of its list price. In other words, we or the dealers recover enough money at the end of the year to easily pay for the new equipment which is to go

into the school for the following year. The recovery is more than ample also to take care of delivery and connection.

Advertising Value

The advertising value and prestige gained for the appliances used in the schools are considerable, and the dealers who are interested in future sales are most ready and anxious to get their equipment into the schools. The same, of course, is true of the manufacturer and the jobber. In some cases where the manufacturer does not allow a special discount, the jobber has taken it upon himself to forego his normal profit to see his equipment used in the schools.

Each year when the equipment is placed in service, my company's Home Service representatives check the appliances to make sure that they are functioning properly and give preliminary instruction to the Home Economics teachers. Usually during one of the first class periods after school opens, one of our Home Economists explains the use of the equipment to the entire class. The annual replacement basis increases these very desirable Home Service contacts with the Home Economics teachers and also with the students.

There are many details of the plan which time does not permit to cover at present, but they are explained in our booklet. These have all been handled in a rather simple manner. One question that is frequently asked is "Suppose the school selects an appliance more valuable in some succeeding year?" This may be due to preference or to ascending prices. On this point the contract stipulates that if the replacing appliance has a retail value of more than 10% greater than the replaced appliance, the school will pay 50% of such increase in the retail price.

Sometimes the question is asked whether it is possible during the term of the contract for the school to change the brands of equipment. This is easily accomplished by the school returning the original appliance to the dealer, who will return the purchase price, and of course the dealer is then free to sell the appliance as he chooses. The school is also free to enter into a new replacement agreement for another brand of appliance.

In the administration of this plan, it is always our aim to provide fully automatic ranges when they are available.

Response is Gratifying

The response to this modernization program has been both excellent and enthusiastic from virtually all concerned. My company furnishes gas service exclusively to some cities, electric service exclusively to others, and in some of our larger cities we supply both gas and electric service. In our area we have fifty-nine high schools or colleges with Home Economics departments. Of this fifty-nine, thirty-seven or about 65% have already purchased equipment under the plan. Only one school was not interested and the remaining twenty-two schools have indicated to us that just as soon as funds are made available to them they will modernize their departments. Several of the schools, because of the attractiveness of the plan, have expanded their departments. In one case, a high school that did not previously have a Home Economics Department has put one in because of the simplicity and economy of the plan. Two other small high schools are contemplating doing likewise within the next year.

We felt that we were many years too late in the inauguration of this plan when we replaced gas ranges and gas plates in one of our teachers colleges that had been in service for thirty-one years.

Contacts on the sale of equipment under the plan are handled by our Sales Supervisors. Our Home Economists are called in for advice on department planning or selection of equipment.

Our Home Economics Kitchen Replacement Program has produced a lot of interest in some of the newer appliances and a number of our schools have, for the first time, installed gas clothes dryers and automatic cycle washers.

Our two years experience with this plan enables us to say that our organization is justifiably 100% in favor of it and that it is ideally suited to the conditions in our territory. We take a lot of pride in the fact that this plan has not only contributed to our own welfare as a utility, but perhaps more important, that something very worthwhile has been done for the schools, the teachers and the students.

Make That Advertisement Simple

Editor:
American Gas Journal

With days of selling ahead, more thought will be given advertising. The days when merchandise will be plentiful will call for a different type of advertising than the type used during the war and these past few years.

The type of advertising that in the past, and will in the future, ring cash registers will be specific, free of big words, advertising that talks the language of the customer on the other side of the counter.

This is the type of advertisements that all companies may use advantageously. If an agency writes the copy, the advertiser and account executive will sit down and talk out what is to be said, simply, sincerely, cut the superlatives and go slow on adjectives.

Good advertising copy never admonishes the reader, it never argues, or talks of stupendous advantages to be gained.

Where the advertising is written by the sales manager, as is the case with a great many gas companies, he, having full knowledge of the appliance or service he wishes to promote, will do well to write it just as though he were reciting his story to a prospective customer face to face. This type of chatty informal advertising will result in far more sales than so much of the type we see where a manufacturer's mat was "dug up" and given a company signature to meet a dead line of a local newspaper.

The best advertisements ever written are those that are simple, straight forward statements written by a man who knows his merchandise inside and out.

Be specific and remember that eighty percent of the people who will see the advertisement have little more than a grammar school education—make your advertisements simple, sincere and they will sell.

Old Timer

Chirurg Appoints Lane

J. T. Chirurg, President of the James Thomas Chirurg Company, Boston and New York advertising agency, announces the appointment of E. Gordon Lane as General Manager, in complete charge of the agency's New England operations, effective January 2, 1948.

Mr. Lane, a native of Boston, was formerly president of a consulting advertising firm in Montreal, Canada, later becoming New England Representative of Esquire Magazine. He joined the Boston office of the Chirurg Company in 1942 as account manager, was appointed a Vice President in 1945 and shortly thereafter was elected to the Board of Directors.

A. G. A. Activities

C. G. Simpson to Head A.G.A. Personnel Committee

C. G. Simpson, Manager, Personnel Department, The Philadelphia Gas Works Company, has been appointed Chairman of the American Gas Association Personnel Committee, it was announced by Hudson W. Reed President of A.G.A. and President, The Philadelphia Gas Works Company. Mr. Simpson succeeds Fred R. Rauch, Vice-President, The Cincinnati Gas & Electric Company. Comprised of executives in charge of industrial relations of gas utility companies, the Personnel Committee is one of the important general committees of the Association.

C. G. Simpson

Mr. Simpson was formerly Assistant Manager of the Customers Service Department of The Philadelphia Gas Works Company. As an officer during World War II, Mr. Simpson won the War Department's Legion of Merit Award. In his home state of Pennsylvania, he is a member of the Governor's Labor-Management Advisory Committee. Long a participant in industrial relations activities in his community and in the gas industry, Mr. Simpson has been a member of the A.G.A. Personnel Committee for many years.

Midwest Personnel Group To Meet in Omaha

The next meeting of the American Gas Association Midwest Personnel Conference will be held at the Fontenelle Hotel, Omaha, Nebraska, on Wednesday, February 25, according to an announcement of the Chairman, Vernon Myers of the Sioux City Gas and Electric Company. All industrial relations executives of gas companies in the Midwest territory will be welcome. Hotel reservations may be made through George C. Pardee, Assistant Personnel Director, Metropolitan Utilities District, Omaha, Nebraska.

Feature of the meeting will be a discussion of safety to be led by J. D. Killoren, The Laclede Gas Light Company, St. Louis. This discussion will develop ways and means by which safety efforts may be better correlated with other company personnel work in the interest of economy and increased effectiveness. Kurwin R. Boyes, Secretary of the American Gas Association, will report on national developments in the personnel field.

A.G.A. Spring Conference

The annual A.G.A. Sales Conference on Industrial and Commercial Gas will be held this year in Windsor, Ontario, Canada, April 7, 8 and 9, according to the announcement by Leon Ourusoff, Chairman, Industrial and Commercial Gas Section, American Gas Association.

An outstanding program has been prepared by the Section's Program and Papers Committee under the Chairmanship of Harry A. Sutton. Following last year's pattern, the three-day Conference will be divided to cover different phases of the Gas Industry. The first day, Wednesday, April 7, will be given over entirely to Industrial Gas subjects. On Thursday, April 8, the morning and afternoon sessions will cover subjects of general interest to all gas men, and the formal luncheon will take place on that day, at which it is hoped that a prominent Canadian will be the featured speaker. On the last day, Friday, April 9, only Commercial Gas subjects will be discussed by the speakers. Tentative plans call for some committee meetings during the Conference which will be arranged so that they will not interfere with attendance at sessions. It is hoped that this 1948 Conference will be well attended as the subjects tentatively selected for presentation and discussion promise one of the best conferences the Association has ever held.

Galvanic Corrosion in Gas Hot Water Storage Heaters

The Committee on Domestic Gas Research, American Gas Association, has issued Part I of a report on Galvanic Corrosion of Dissimilar Metals as Applied to Gas Hot Water Storage Heaters.

The conclusions reached, state:

1. Data gathered from open beaker tests with waters containing dissolved oxygen do not give the same results as those obtained by testing in closed systems. Much more corrosion is encountered in closed systems. Therefore the data from one type of testing should not be used to predict behavior of metals under other conditions of test.

2. Magnesium is better than zinc for stopping galvanic corrosion of couples in beakers filled with water at atmospheric pressure.

3. The usual treatment with a complex calcium sodium phosphate for preventing internal corrosion of hot water storage heaters does not stop galvanic corrosion of dissimilar metals used in the system.

4. Electrical insulating materials are effective for stopping galvanic corrosion.

The report in pamphlet form, 8½ x 11, covers 23 pages, amply illustrated. Available through the A. G. A., 75 cents a copy.

Gas Pilot Burner Research

Research Bulletin No. 46 has been issued by American Gas Association. Its preparation was supervised by the Technical Advisory Group for Burners, Controls, and Accessories Research.

Variations in size and position of primary air openings, burner tube diameter, shields and other protective devices are discussed relative to the design of a satisfactory blue flame pilot burner for resisting stoppage due to dust and lint suspended in the atmosphere. All results reported are based upon studies made with natural gas in experimental test chambers.

A recently developed incinerator-type pilot burner was constructed and its performance is compared with that of conventional pilot burners. Pilot burners drawing all of their primary air from the main burner head or main burner venturi are also discussed as a possible solution to the problem.

From results of this investigation which was conducted with natural gas only in experimental test chambers, it appears that the type of atmospheric pollution encountered; pilot burner design, including the use of protective devices; incineration of primary air, the use of primary air settling chambers; and pilot burner position all have some effect on the rate of closure of pilot burner primary air openings due to polluted atmospheres.

Under conditions simulating those normally found in the home, it appears that pilot burners having a large diameter gasway and port area; a short, straight gasway; and large circular primary air openings located well downstream from the orifice will operate most effectively if they are not otherwise protected from atmospheric impurities.

Pilot burners mounted so as to receive all primary air from a large settling chamber, such as the main burner, appear to resist closure by dust and lint far more effectively than any other pilot burner arrangement or design. If such an arrangement is employed, however, proper precautions must be taken to insure desirable pilot operating characteristics.

Results of this investigation seem to indicate that the majority of small protective devices or shields attachable to pilot burners are a hindrance rather than a help in resisting closure of pilot burner primary air openings by fine, dry dust and dust and lint mixtures. In order for such protective devices to be effective, they must be very carefully designed and tested under atmospheric conditions expected to accompany their operation.

The addition of an incinerating device for primary air should generally considerably increase the uninterrupted operating time of a pilot burner exposed to dust and lint atmospheres.

When mounted vertically, the majority of pilot burners studied tend to operate for a slightly longer period of time than when mounted horizontally.

This bulletin has just been issued, 28 pages, 8½ x 11, illustrated. Available through A. G. A., price $1.75.

New Equipment and Appliances

New Heating Torch Uses L.P. Gas

Over 8 full hours burning time, 3800°F. operating flame, filling costs of less than 2c, hand-size convenience . . . these are some of the features of the Crown Torch, completely self-contained heating torch which operates with butane or propane gas.

This unit is designed for many soldering, brazing, and heating operations. Uses include sealing sweat joints, lead burning, light brazing, radiator soldering and repairing, sealing batteries, thawing frozen pipes, paint burning, soldering of copper pipe, silver soldering, heating and bending.

Made of 16 gauge seamless brass tubing; the torch has a pressure capacity of over 2200 psi. Operating pressure with butane and propane gases is 90 to 150 psi. It tests well within the safety specifications of the API and ASME.

Crown Torch

Size is 12 inches long, 2¼ inches in diameter, and weighs 2½ pounds when full. A heating torch that has small tool convenience.

Other features include fingertip control of flame size and temperature, patented "all-in-one" tip which eliminates need for tip changes, and can be filled from any standard butane or propane tank.

Manufactured by Sully Engineering Ltd., 7414 Melrose Ave,, Los Angeles 46.

New Gas Filter

A filter to prevent all foreign matter entering a gas burning appliance is manufactured by Gas and Oil Industry Laboratories, Inc., Irvington, New Jersey. Designed for installation before appliance, the filter's large area of filtration is designed to prevent pilot outages, sticking valves, and impairment of controls.

Gas Filter for Water Heaters

At present, commercial production is limited to a ¾" I.P.S. model that passes 40 cubic feet of manufactured gas per hour at ½" water column pressure loss. This model, approved by the American Gas Association, is for use by manufacturers of domestic gas water heaters, or by utilities and plumbing and heating contractors when installing the heaters.

Larger sizes for industrial use will later be available.

Tube Fitting

Development of a revolutionary new two-piece, completely self-flaring tube fitting, which may be applied to many varieties of tubing, was announced recently by the Brockway Company, of Naugatuck, Conn., manufacturers of Broco Products.

The new fitting, known as the "Uniflare," is claimed to offer all the advantages of both compression fittings and flared fittings, with none of the usual disadvantages of either. It may be used effectively with tubing of various metals, including copper, aluminum, monel, plastic, "Bundyweld" and other varieties of steel, within a wide range of wall thickness.

Plain end tubing is inserted in the fitting and made up in the conventional manner. The tube is self-extruded and self-flared by simple wrench action during the makeup. The fitting is so designed that the nut, body and thrust collar combine to produce the same smooth positive action as an extrusion press—the thrust collar shearing from the nut when wrench pressure is applied.

Made in sizes from ⅛ inch to ¾ inch, in all the usual commercial shapes.

Incinerator for Homes

Under the trade name "Cinerator" a new refuse-disposal unit, operating with manufactured, natural or L. P. gas, is offered by Main Electric Company, Inc., Rochester 2, New York. This unit has internal capacity of 3¼ cubic feet; Size 20 x 22 x 35 inches and weighs 120 pounds net.

Domestic "Cinerator"

Outstanding features include: (a) Uses the new double burning principle to recirculate fumes and gases through the fire, thus burning them completely, eliminating odors and smoking. (b) Equipped with heavy cast aluminum top to quickly dissipate heat. Helps obtain warm dry cellars. (c) Has twin grates which dump toward the center, into large sized ash drawer. (d) Top lid is insulated with high temperature mica cement. (e) Finish is 2 tone baked wrinkle enamel.

Bulletin with further data on request.

News of the Gas Industry

Imperial Valley To Tap the 30 Inch Natural Gas Line in California

The California Utilities Commission on December 22 handed down a decision approving an application of Southern California Gas Co. of Los Angeles to purchase gas properties operated in the Imperial Valley of southeastern California by Coast Counties Gas & Electric Co.

The commission's order approved a transaction entered into by the two gas companies whereby the Los Angeles utility has acquired for a purchase price of approximately $800,000 three butane-air gas systems operated by Coast Counties at Brawley, El Centro and Calexico in Imperial County. Included in the transfer are the butane-air generating plants in the three cities and mains, services and other properties.

It was announced in December at the Los Angeles offices of Southern California Gas Co. that, for the time being, the new owners propose to continue distribution of butane gas through the existing systems. As soon as pipe becomes more readily available, the company, however, plans to apply to the Federal Power Commission for authority to expend approximately $1,000,000 on a transmission line from the 30-inch Texas-California pipeline to towns in the Imperial Valley now served by the butane-air systems. This will make Texas natural gas available for distribution for the first time in the Imperial Valley. The projected pipeline, it was announced, will be routed through Niland, Calipatria, Imperial and Holtville, permitting gas from the Texas-California line to be served in those communities, as well as the other cities in Imperial Valley already receiving service from the former Coast Counties system.

With the introduction of natural gas, Southern California Gas Co. expects to expand the service into some rural areas along the route of the proposed pipeline and also to offer natural gas fuel for use in industrial plants on an interruptible basis. As soon as natural gas lines are built, the company expects to be able to make substantial rate reductions.

To operate the new service, the company has established an Imperial Valley division, with about 4,000 new customers and a personnel of approximately 20. The new owners are retaining the existing personnel and management. Fred Hix, manager of the Imperial Valley gas properties under the Coast Counties ownership, has been asked to continue in a similar capacity for Southern California Gas Co.

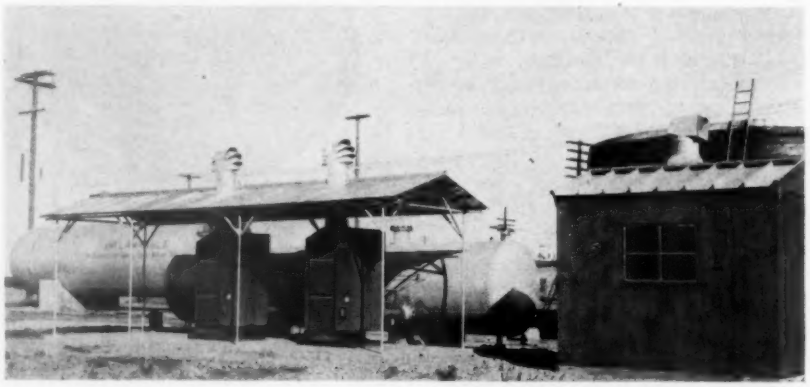
A program likewise is being developed to make available to the new members of the company all the employee benefits now provided for Southern California Gas Co. personnel.

In another decision handed down in the closing week of the past year, the California Public Utilities Commission defined the gas distribution rights in the area tributary to Indio, Calif., situated at the southeastern edge of the Coachella Valley.

The decision, handed down December 17, denied the petition of the Indio Gas Company for exclusive serving rights in a 24-mile square area around Indio. The decision granted the Indio Gas Co. the right to serve a four square mile area outside the city limits, while Southern California Gas Co. was given serving rights in the rest of the county territory in and around Indio.

The case was laid before the Commission for determination in connection with Southern California Gas Company's request for permission to tie-in between the Texas pipeline and the Palm Springs distribution system, and to build a line to serve the town of Coachella. Since the proposed pipeline was to connect to the Texas line at a point directly north of Indio, the Indio Gas Co. requested the Commission to deny Southern California Gas Co. the right to serve any customers where the line crossed unincorporated territory around Indio.

At two hearings before the Commission it was shown that the Indio Co. was serving some 120 customers outside the city limits of Indio, although it held no county franchise at the time. The commission granted the Indio Gas Company's request for a certificate of public necessity and convenience to operate in county territory it has already been serving, according to area limitations defined by the ruling.



Two Gasair Machines with total capacity of 50,000 c.f.h. at Redding plant of Pacific Gas & Electric Company.

L.P. Replaces Oil Gas Plant At Redding, Calif.

The Pacific Gas & Electric Company of San Francisco has recently placed into service at Redding, California, a completely modern propane-air gas plant replacing the 550 BTU manufactured oil gas which had been served in that community for many years. The propane-air gas has a calorific value of approximately 935 BTU.

Site for the new plant is located some 400 feet west of the old manufactured gas plant in an open area of about 1½ acres. An old reserve water seal holder of 50,000 cu. ft. capacity as well as storage and maintenance sheds were dismantled to create the new site. Photo shows the new plant in the last stages of completion.

The propane-air plant was designed and installed by Pacific Gas Corporation and is equipped to receive propane delivery by either railroad tank car or truck tank. Unloading of liquid is accomplished by means of a vapor differential compressor located in the unloading tower shed. One 30,000 gross gallon propane storage tank is now in use and facilities exist for the addition of another tank when anticipated increased load warrants.

Vaporizing and mixing of the propane is accomplished by the use of two VM-6 Gasair machines each having a capacity of 25,000 c.f.h. All pipe manifolding is arranged for additional Gasair equipment.

Last year a similar plant was constructed and placed in operation by Pacific Gas Corporation at the Grass Valley, California, property of P. G. & E. and another PGC propane air plant is now under construction for P. G. & E. at their Red Bluff, California, property.

The three new plants will have replaced the last of existing manufactured oil gas plants for Pacific Gas & Electric Co.

F. E. Weldon Appointed To N. Y. Office General Controls

General Controls Co. announces the appointment of F. E. Weldon as factory branch manager of their New York office, 101 Park Avenue, New York.

Mr. Weldon has been with the company in the capacity of A. G. A. representative in Cleveland, Ohio.

Mr. Weldon's vast experience in the gas industry combined with his ability to render service to users of automatic pressure, temperature and flow controls qualifies him well for his new position.

Southern Gas Assn. Meeting at Galveston, March 24-26

Advance requests for hotel reservations from S. G. A. member companies indicate that the attendance for the 1948 Convention will be in excess of 1200. The 1948 Convention is scheduled to be held in Galveston, Texas, on March 24. 25, and 26, 1948.

Fred D. Bradley, Chairman of the General Convention Committee and his committee consisting of F. J. Evans, vice-chairman, F. J. Evans Engineering Company; E. T. Anderson, Atlanta Gas Light Company; Allan F. Burns, Arkansas Louisiana Gas Company; C. E. Cloud, Oklahoma Natural Gas Company; H. K. Griffin, Mississippi Gas Company; D. W. Reeves, Oklahoma Natural Gas Company; J. Frank Scott, Southern Natural Gas Company, and Mrs. Winnell Simmons, Houston, Houston Natural Gas Company, have planned a program which will be of practical interest to those in every phase of the gas industry. An outstanding Friendship Room is promised by the manufacturers and golf, fishing, and other seashore recreation will be amply provided. Both the Buccaneer and Galvez have been designated headquarters hotels and convention meetings are being scheduled at both.

Pacific Coast Gas Assn. Annual Convention

Pacific Coast Gas Association has selected Santa Cruz as the site of their 1948 Annual Convention. The dates are September 14, 15 and 16. The Hotel Casa del Rey will be fully reopened and refurnished this spring and its beach location has been surrounded by modern apartments, hotels and auto courts, promising adequate and luxurious accommodations. Santa Cruz has a fine civic auditorium, and its beaches and forests afford recreational possibilities without limit.

Clifford Johnstone is Managing Director of the Association. Headquarters, 447 Sutter Street, San Francisco 8.

New Officers of the Oklahoma Utilities Association for 1948

President: L. A. Farmer, President Northern Oklahoma Gas Company, Ponca City.

First Vice-President: Malcolm Morrisson, Assistant to the President, Oklahoma Gas and Electric Company, Oklahoma City.

Second Vice-President: D. W. Reeves, General Sales Manager, Oklahoma Natural Gas Company, Tulsa.

Treasurer: H. H. Ferrin, Treasurer, Oklahoma Gas and Electric Company, Oklahoma City.

Secretary: Miss Kate A. Niblack, 625-626 Biltmore Hotel, Oklahoma City.

1948 Annual Convention Dates: March 11 and 12, 1948, Biltmore Hotel, Oklahoma City, Oklahoma.

CONVENTION CALENDAR

February

16 *Midwest Regional Gas Sales Council,* Hotel Congress, Chicago.

25 *Midwest Personnel Conference A.G.A.,* Fontenelle Hotel Omaha, Neb.

March

10-11 *Eastern Natural Gas Regional Sales Conference,* William Penn Hotel, Pittsburgh.

11-12 *Oklahoma Utilities Assn.,* Biltmore Hotel, Oklahoma City.

18-19 *New England Gas Association,* Annual Meeting, Boston.

24-26 *Southern Gas Association,* Galveston, Texas.

30 to April 1 *Mid-West Regional Gas Sales Conference,* Edgewater Beach Hotel, Chicago.

April

5-7 *G.A.M.A. Annual Meeting,* Drake Hotel, Chicago.

7-9 *A.G.A. Sales Conference, Industrial & Commercial Gas Section,* Windsor, Canada.

8-10 *Mid-West Gas Association,* Annual Meeting, Nicolett Hotel, Minneapolis.

8-10 *Gas Meters Assn., Florida & Georgia,* Hollywood Beach Hotel, Hollywood, Fla.

12-13 *Florida Liquefied Petroleum Gas Assn.* Sheraton Plaza Hotel Daytona Beach, Florida.

13-15 *Southwestern Gas Measurement Short Course,* University of Oklahoma, Norman, Okla.

14-17 *National Restaurant Association Show,* Cleveland.

19-21 *Distribution-Motor Vehicle Conference, A.G.A.,* Hotel William Penn, Pittsburgh.

22-23 *Indiana Gas Association Convention,* French Lick Springs Hotel, French Lick, Indiana.

28-30 *Missouri Assn. of Public Utilities,* Annual Convention, Hotel Jefferson, St. Louis, Mo.

May

4-5 *Natural Gas Department, A.G.A.,* Rice Hotel, Houston, Texas.

18-20 *Pennsylvania Gas Association, Annual Meeting,* Galen Hall, Wernersville, Pa.

24-25 *New York—New Jersey Regional Gas Sales Conference,* Westchester Country Club, Rye, N. Y.

24-26 *Production and Chemical Conference,* Berkeley - Carteret Hotel, Asbury Park, N. J.

27-28 *Natural Gas and Petroleum Association of Canada,* General Brock Hotel, Niagara Falls, Ontario.

31-June 6. *Liquefied Petroleum Gas Assn.* Annual Convention, Sacramento, California.

June

30-July 3 *Canadian Gas Assn.* Annual Convention, Jasper Park Lodge, Jasper, Alberta.

September

14-16 *Pacific Coast Gas Assn.,* Annual Convention, Santa Cruz, Calif.

October

4-8 *American Gas Assn.* Annual Convention and GAMA Exhibit, Atlantic City, N. J.

Southern California Gas Co. Issues Educational Map

An outstanding example of goodwill promotion is represented by the Southern California Gas Company's plan in making available global perspective maps of the Texas - California pipeline to schools in Southern California as a basic visual aid in teaching geography.

The Los Angeles gas utility's advertising department developed large 50x35 inch global perspective maps to illustrate the magnitude of the $70,000,000 pipeline project which is delivering gas from the Texas Panhandle natural gas fields to the Los Angeles area at the rate of 305,000 M. daily.

The original map pictures a portion of the North American continent as it might seem to an observer stationed 1400 miles above the Pacific Ocean at a point near Clipperton Island. From this vantage point, the route of the Texas-California pipeline across the rivers, mountains and deserts of Texas, Arizona and New Mexico may be seen vividly.

Requests for copies of the map have been received by Southern California Gas Co. from more than 600 schools, in which the maps are being used as visual aids in geographic classes. Board of Education heads and school principals declare that, with the aid of the map, it is possible to permit children to study not only the physical characteristics of the Western United States, but also to be taught the physical characteristics visually with the economics of the region.

Copies of the map are on display in offices of the gas company throughout southern California. A limited number have also been made available for distribution to industrial concerns and business houses.

Florida L.P. Gas Assn.

The Spring Meeting of the Florida Liquefied Petroleum Gas Association will be held at the Sheraton Plaza Hotel, Daytona Beach, Florida on April 12th and 13th.

W. S. Guitteau is General Chairman of the Convention Committee.

Mid-West Gas Association

The Mid - West Gas Association will hold its 43rd Annual Meeting and Convention April 8-10 at the Nicollet Hotel, Minneapolis. H. E. Peckham is Secy.-Treas. Address care of Northern States Power Co., St. Paul 2, Minnesota.

Cooper-Bessemer Executives Become Vice Presidents

The Cooper-Bessemer Corporation has announced the elevation of three of its sales executives to positions of Vice-President.

Those so honored, in recognition of their outstanding sales achievements and their many years of service, include J. W. Reed, the company's Atlantic Coast Manager of Gas Engine and Compressor Division; A. A. Burrell, Southwestern District Manager, with headquarters in Dallas; and B. L. Potter, Midcontinent Manager with headquarters at Tulsa, Oklahoma.

J. W. Reed A. A. Burrell B. L. Potter

Mr. Reed, a Cooper-Bessemer veteran of 25 years service, served the company as Pacific Coast Manager from 1925 to 1940 when he assumed his present position in New York.

Mr. Burrell joined Cooper-Bessemer on January 1, 1925 when it was the C. & G. Cooper Company and has been Southwestern District Manager since that time. He has had widespread experience in the Texas, Louisiana and Arkansas oil fields as well as in the development of numerous gas pipe line projects.

Mr. Potter will soon complete his 35th year in the engine-building industry. He joined the Bessemer Gas Engine Company in January of 1913 and was in charge of its Mid-Continent area in 1929 when the company merged with the C. & G. Cooper Company to become Cooper-Bessemer. Since that time, Mr. Potter has occupied the position of Branch Manager of the Tulsa office.

New Compressor Plant for Southern California Gas Co.

Southern California Gas Co., Los Angeles, has awarded contract in an amount approximating $1,000,000 for the construction of a new compressor plant and station at 1700 Santa Fe Avenue, Los Angeles.

The contract, awarded to the J. H. Gill Co., Los Angeles, calls for the construction of a building to house new compressor units for the Santa Fe Avenue station of the firm, and the installation of the compressor, piping and auxiliary equipment.

The project calls for the erection of a building on a site adjoining the company's old gas plant at that location. The building will be 40 x 159 feet in dimension, in two sections. One, in one story height, to house the compressor units, and a two-story section for auxiliary air compression equipment, pumping units, office area, locker rooms and lunchroom facilities.

The equipment to be installed consists of four 1000 h.p. Cooper-Bessemer units and two 400 h.p. Ingersoll-Rand air compressors to supply the compressed air for the entire area. One is equipped with an auxiliary electric generator to serve as a standby for power and light in emergencies.

The work is expected to be completed by May or early in June.

Hammel-Dahl Company Inc.

In order to properly handle a greatly increased volume of sales in the automatic control field, Hammel-Dahl Company, Providence, R. I., has been incorporated, effective January 1, 1948. The incorporation offers effective service with the addition of plant facilities. There will be no change in the management of the company.

E. T. Dahl Bruce A. Irwin B. G. Woolley Thomas Ponton

E. T. Dahl, President, is generally recognized as an outstanding designer and inventor of control valves. He originated the Venturiflo-angle valve for use in Refinery Cracking Plants. He also holds patents on Packless valves used by the Chemical Industry. Currently Mr. Dahl has designed special valves for the underground storage of natural gas, microflo valves for pilot plant work and control valves which function smoothly at 25,000 p.s.i. pressure.

Mr. Dahl has been in instrumentation since graduating from Pratt Institute in 1924. He was Chief Engineer of Mason-Neilan Regulator Co. before organizing the Hammel-Dahl Company with Mr. B. G. Woolley as his partner.

B. G. Woolley, Treasurer, holds a number of patents on automatic control equipment, particularly related to combustion control applications. He was employed by General Motors prior to his joining Hammel.

Bruce A. Irwin, Vice-President and Secretary, will continue to supervise Sales. He has been active in the application of automatic control equipment since 1930. During the war years he was in Washington, D. C. in the Materials Division of the Petroleum Administration for War. Mr. Irwin was for 15 years with Mason-Neilan Regulator Co. in Pittsburgh, Pa.

Thomas Ponton, Vice-President, will continue in active charge of plant operations. Mr. Ponton is widely known in the Providence area for his executive ability. Before joining Hammel-Dahl Co., he was employed by the Federal Products Co.; Simplex Tool Co., The Langlier Manufacturing Co., The Liberty Tool and Gage Works.

Philadelphia Electric Co. Submits Revised Gas Rate

The Philadelphia Electric Company has filed an amended answer to the Public Utility Commission's investigation into the former's proposal to increase rates to its 156,000 gas customers. Notwithstanding the fact that it believes its proposed gas rates are "fair, just and reasonable," the Electric Company offered, in order to compose the present proceeding, to submit a tariff reducing the last step of the new house-heating rate by 10 cents, and the peak-up step of its wholesale rate by a like amount.

Evidence was offered by the Electric Company to show the significance of this proposal in terms of revenue. On the basis of actual sales for the twelve months ended November 30, 1947, it disclosed that this change would mean that the utility would collect $285,000 less than it would have collected under the rates originally filed. In addition, the company presented data showing increases in operating costs; and with respect to additions totaling $8,182,000 made to its gas plant during 1947 and scheduled for completion in the current year.

New Range Has Upper Level Cooking and Automatic Features

Shown for the first time at the American Furniture Mart in Chicago in January, was the new Hardwick Challenger Automatic Gas Range.

It was designed for those who prefer upper level cooking. Both oven and broiler are at the right height for convenience and comfort. Cooking fatigue is eliminated as no bending is required for any cooking operation whether it be in the oven or broiler or on the top of the range.

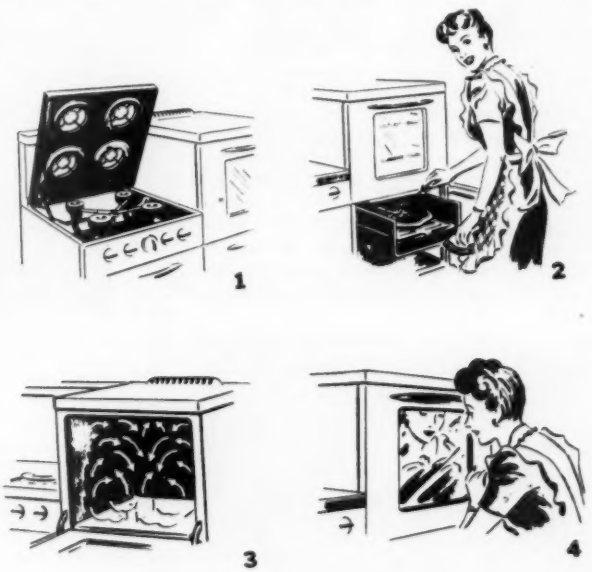
Ample space for utensils normally used on the range is built into the oversize storage and utility compartments. The large broiler swings out and back at the touch of a finger and broiling is done from a standing position—no stooping.

Other innovations and features are the exclusive Mirro-Magic oven with transparent mirro-door, new DeLuxe stainless steel grates . . . simmer-set valves, oversize balanced heat oven and automatic lighting of oven and top burners. Clean cooking is provided in the lustrous porcelain finish; rounded oven corners; extra deep spill over tray and hinged cooking top for easy access to burners.

This range is manufactured by the Hardwick Stove Company, Cleveland, Tennessee, pioneers in cooking appliances since 1879.

1—Hinged Cooking Top.
2—Rite-Hite Broiler
3—Balanced Heat Oven.
4—Oven Door,—light off for mirror, light on for window.

The Hardwick Challenger



Radio Station Permits Given Mfrs. Light & Heat Co.

Construction permits have been granted and call letters have been assigned by the Federal Communications Commission to the Manufacturers Light and Heat Co. for the first of the gas company's short wave radio sending and receiving stations. Work will soon be started on installing the first three permanently located transmitters and receivers.

The unit to be located on gas company property at Hickory in Washington County, Pa., is identified as WJVX. At Ellwood City, in Lawrence County, Pa., the call letters assigned are WJVP. The station in Elk County, near Kane, Pa., has been identified as WJVK.

The gas company also was assigned call letters WJVZ to be used by the first 15 mobile sets for sending and receiving from gas company cars and trucks.

The frequency modulation short wave radio network of the gas company will be employed for emergency communication to improve dispatching, control and operation activities related to more than 10,000 miles of natural gas production and transmission lines operated by the Pittsburgh Group of affiliated gas companies in the Columbia Gas System.

CLEVELAND

"A" TYPE METERS
"B" TYPE METERS
DIAPHRAGMS

Cleveland Gas Meter Co.
ESTABLISHED 1875
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For Real Gas-purifying Power
CONNELLY IRON SPONGE

• To get top efficiency in gas-purification at the lowest cost, use Connelly Iron Sponge. It's the finest purification material to be had.

Connelly Iron Sponge has a high degree of activity. It gives longer service before fouling. It revivifies more quickly. Leading gas companies have been using this "blue-ribbon" purification material for years—they know it can be relied upon to do the best job.

If you have a problem in gas-purification, take advantage of Connelly's 71 years of experience. Our engineers will be glad to help you . . . there is no obligation. Consult Connelly!

CONNELLY, INC.
3154 S. California Ave., Chicago 8, Illinois
Elizabeth, N. J. Los Angeles, Calif.

Cost of House Heating by Gas in Pittsburgh, Pa.

A twelve year study of average daily temperatures recorded at Pittsburgh shows that January and February account for 37.5% of the total low winter temperatures which have a direct ratio to the amount of fuel used, according to Wallace K. Sheppard, Heating Engineer with The Peoples Natural Gas Company.

Local homes require heat 8 months a year and house heating plants go into action when the average daily outside temperature drops below 65 degrees.

Gas heating bills for an individual home can be estimated by the householder if the cost of gas used for other appliances such as ranges, refrigerators and water heaters is deducted, states Mr. Sheppard, who suggests the following method:

"Total your gas bills for the four non-heating months, divide by four to get an average, and add 25 per cent. Subtract this amount from your total gas bill for a month in which gas heat was used and you have a very close estimate of your heating cost. The 25 per cent added to the summer bills is to provide for the fact that you cook more in winter and food and water for cooking must be heated from a lower temperature. And people take more warm baths in winter than in summer."

N.E.G.A. Industrial Sales Div. Hears Mackay on Water Htg.

Malcolm B. Mackay addressed a meeting of the Commercial Sales and Engineering Group of New England Gas Association on January 16th at Hotel Kimball, Springfield, Mass., on Large Volume Water Heating and Sterilization.

His instructive and informal talk was planned for questions from the floor throughout, which enabled a most informative round table discussion.

Among many subjects covered, he drew attention to the desirability of the water heating load, pointing out for example that a restaurant serving 500 people would call for 298 m.c.f. of natural gas or 560 m.c.f. of manufactured gas daily to supply 170 degree water at uniformly stable temperature.

Fifty or more sales and service engineers attended the meeting.

Robey To Coordinate Gas Production Research

Thomas Lee Robey, formerly assistant superintendent of production for the Washington Gas Light Company, Washington, D. C., has been appointed Coordinator of Gas Production Research of the American Gas Association, effective January 1, 1948, according to an announcement by H. Carl Wolf, managing director of the Association. Mr. Robey is now assistant to Dr. Newcomb K. Chaney, who became research consultant of the gas production and general technical research program last November 1.

Thomas L. Robey

The A. G. A. Gas Production Research Program is part of a greatly enlarged cooperative industry research and promotional program, now in its fourth year of operation. Its objective is to find better and more economical ways to produce gas and continuing projects are now under way at the A. G. A. Laboratories, Institute of Gas Technology, in utility plants, and at a number of universities, scientific and governmental institutions outside the industry.

Matlack of Illinois Power Co. Now at E. St. Louis, Ill.

William H. Matlack, for the past 12 years in sales promotion and advertising work with Illinois Power Company at Champaign and Decatur, Illinois, has been transferred to the East St. Louis office, his home town, where he will do special work for the company.

Steel Deliveries Delay 400-Mile Gas Pipeline

The Cities Service Gas Company's 400-mile 26-inch natural gas pipeline from the Hugoton Field in Southwestern Kansas to the Kansas City area will require 3,200 cars of pipe—about 93,000 tons of steel—and more than 350 cars of other materials. The pipe was originally scheduled for delivery beginning in May, 1947, but because of delays caused by the general steel situation, the pipe manufacturer had to revise the date to May, 1949, a setback of two years. By buying steel plate directly from steel mills and shipping this plate to the pipe mill to be fabricated into pipe, the company will be able to get sufficient pipe to complete about half of the line during 1948, connecting at a convenient point on the present system. The extension on into Kansas City must wait.

The initial compressing station on the Hugoton-Kansas natural gas pipeline project is now under construction in Grant County, Kansas, and, when completed, will include eleven compressing units totaling 17,600 horsepower, a gas dehydration plant, and a complete community to serve the needs of station employees. When this project is completed, the company's gas pipeline system will have a delivery capacity of more than one billion cubic feet on peak days, equivalent under normal efficiencies to about 50,000 tons or 1,250 forty-ton railroad cars of coal.

Natural Gas Research

A new company, Cities Service Research and Development Corporation, has been organized by Cities Service Company as the first major step in a program for the centralization and expansion of Cities Service research and development activities. An ultra-modern research laboratory is being developed for the New York area, as headquarters for several hundred chemical and scientific workers. The program will cover the entire petroleum field, extending into the realm of plastics, detergents, medicines, paints and lacquers, as well as synthetic fuels. Among its projects will be intensive research in cooperation with M. W. Kellogg Company of New York in the synthesis of liquid petroleum products from natural gas.

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For Sound Values and Continuous Operating Economy

Meters for Domestic and Industrial Use. All Sizes 5B to 60C.
Wet Test and Demonstration Meters — Diaphragms —
Service Cleaners — Provers — Meter Repairs

Write for details and quotations

SUPERIOR METER COMPANY, INC.

167 41st Street ***Brooklyn 32, N. Y.***

Shelgren Succeeds C. J. Gregg for Dresser Mfg. Division

Dresser Manufacturing Division, Bradford, Pa., has announced the appointment of W. LeRoy Shelgren as Appalachian District Manager, to succeed Charles J. Gregg who retired on January 1, 1948, after 43 years with the company.

Mr. Shelgren's territory will include Western Pennsylvania, Western New York, West Virginia and Michigan.

Charles J. Gregg W. L. Shelgren

Mr. Gregg joined the Dresser Company in 1904 and has served continuously since then. Starting as a mail and file clerk, he worked as office boy, bookkeeper, and head of the Payroll Department. He also has been in charge of correspondence, chief of the Order Department, Traffic Department, Purchasing Agent, and head of the Shipping Department. From the latter position, he assumed responsibility for production scheduling and for a time was Assistant General Manager. Twenty years ago he took over his present position in charge of Sales in the Appalachian District.

Mr. Shelgren brings to his new territory a wealth of experience gained through 23 years with the Dresser Organization. Like Mr. Gregg, he worked in various departments before joining the Sales Force in 1936. He volunteered for Army Service and served from December, 1942 until October, 1945. Since January, 1946, he has sold Dresser products in Michigan, Indiana, Kentucky, Tennessee, Georgia, and Alabama.

Since the summer of 1947, he has travelled in his new territory, becoming familiar with the requirements of his new customers.

Roper Offers a New Adventure in Cooking

In introducing a built-in griddle on many of their most popular models, the Geo. D. Roper Corporation of Rockford, Illinois, brings out some interesting features about this "new zone of cooking" on a domestic gas range.

Illustration shows the built-in griddle in center of range top, an added feature in many of the new Roper models.

The Roper built-in griddle has been scientifically engineered and manufactured. It is made of polished cast aluminum; quick to heat up and to respond to flame temperature; easy to remove for cleaning. The griddle is 10" x 15" on the 38" and 40" ranges. The capacity of the Roper "Town and Country" griddle is approximately one-third greater.

Testing has been conducted to determine proper griddle temperatures for all grilling operations, and the combination of the Roper burner and aluminum griddle have been found to be adequate.

When the receptacle is in place, it is shielded, therefore, none of the fats are exposed to the open flame, consequently, a 100% safety factor is involved.

Roper Promotes Key Men

E. Carl Sorby, Vice-President and Director, has just announced the appointment of Norman C. Kreuter as Sales Manager and Pierre Vinet as Director Sales Promotion of the gas range division of the Geo. D. Roper Corporation, Rockford, Illinois.

Associated with the company since 1924 Mr. Kreuter has come up through the ranks and has a wealth of experience in all phases of the company's operations. Mr. Kreuter spent considerable of his early years with Roper in production, production control, order and billing departments. He then transferred to sales and in 1943 was named Assistant Vice-President. In this capacity he was responsible for warehousing, distribution, market analysis, and sales control.

Mr. Vinet has been associated with the Roper Corporation as a member of the Rockford Sales Department for many years, and in 1941 was appointed Assistant

Norman C. Kreuter Pierre Vinet

Vice-President. Under his supervision a complete sales control program for sales managers and retail salesmen has been prepared and put to use by many Roper dealers throughout the country. He has conducted many sales training meetings from coast to coast.

GAS PLANT EQUIPMENT

UGI REFINERY GAS REFORMING PROCESS
UGI NATURAL GAS REFORMING PROCESS
UGI HEAVY OIL PROCESS

GAS DISTRIBUTION
PIPE LINE CONSTRUCTION

THE U.G.I. CONTRACTING COMPANY
A DIVISION OF
UNITED ENGINEERS & CONSTRUCTORS INC
NEW YORK PHILADELPHIA CHICAGO
MAXIMUM RETURN TO CUSTOMER PER DOLLAR EXPENDED

GPM
IRON HYDROXIDE
The mark of
unerring dependability
in purification
GAS PURIFYING MATERIALS CO., INC.
3-15 26th Ave.
Long Island City 2, New York

New Quality Gas Ranges

Newly designed 1948 Quality Gas Ranges, incorporating many new performance and styling features, were displayed at an advance showing December 30th, in the New York sales rooms of the Roberts & Mander Corporation of Hatboro, Pa. and at the Winter Market in Chicago's American Furniture Mart the following week.

Seven new models were displayed, all of them containing innovations designed to increase the efficiency of cooking and to save steps for the housewife.

The display included models of automatic gas ranges built to "CP" standards, all gas-kitchen heating ranges, and combination kitchen heating ranges in which either coal and wood or oil are used for heating. All ranges in the line are available for natural, manufactured, mixed or LP-Gas.

Henry S. Minster, president of Roberts & Mander, said the entire line was designed to make cooking "easier and more efficient" and to add "eye-appeal" to the average kitchen.

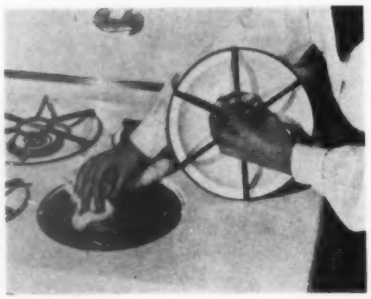
Quality Model A-4-C.P.

To give faster cooking and to permit the use of more than one large cooking utensil at a time, the manufacturer provided for two giant and two standard-size burners instead of the usual single oversize and three standard-size units. The burners are installed in a cluster on the Centra-Cook Top leaving a large work zone on either side.

Burners are designed for maximum ease of cleaning. Individual porcelain enamel burner bowls can be removed and washed in the dish pan. Burners are polished aluminum, light weight, rust proof and easier to handle than the old style cast iron burners.

Most ranges in the line feature the exclusive Uniflex simmer burners. This burner provides a low outer ribbon of flame for simmering to eliminate hot spots developed by other types of simmer burners. Melting butter, cooking chocolate, etc. can be accomplished without the use of a double boiler.

These ranges, built to "CP" standards,



Ease of Cleaning Is Quality Feature

are provided with automatic oven and broiler lighting, and in the A-4 the automatic "Timer-Cook" controls oven cooking automatically. A newly developed 3-Hour Minute-Minder provides automatic control for appliance cooking as well.

New styling features include a streamlined back panel with chrome trimmed lamp, chrome trimmed handles, chrome control panel and a new aluminum Toe-Space base. Most models are equipped with the convenient Visador oven door.

Mfrs. Light & Heat Co. Announces Promotions

Several promotions within the production, transmission and distribution departments of The Manufacturers Light and Heat Co. were announced recently by Irving K. Peck, vice president and general manager.

R. E. Grant, for the last year superintendent of the production-transmission division No. 4 at Hundred, W. Va., has been promoted to the new position of superintendent of transmission.

Mr. Grant now will have full responsibility for the operation and maintenance of all natural gas transmission lines, and the telephone lines, owned and operated by the affiliated gas companies forming the Pittsburgh Group of the Columbia Gas System. The new headquarters of Mr. Grant are in Pittsburgh.

To replace Mr. Grant as head of division No. 4, general foreman Robert E. Lee has been promoted to division superintendent. Mr. Lee came with the gas company in 1915.

W. D. Burdette, general foreman of production-transmission field work for the affiliated gas companies, has been promoted to superintendent of pipe line construction and maintenance.

In this newly created position, Mr. Burdette will assist superintendents of production, transmission and distribution; district managers and division superintendents of the Pittsburgh Group companies, in the construction and maintenance of natural gas pipe lines under their supervision.

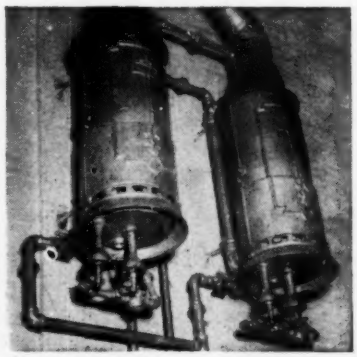
Also announced is the advancement of Karl K. King, distribution engineer for the Pittsburgh Group affiliated gas companies to the position of assistant superintendent of distribution for the Group.

Laclede Appoints Eddins Asst. to President

Henry A. Eddins has been appointed assistant to Robert W. Otto, president of The Laclede Gas Light Company, St. Louis, Mo.

Until his appointment, Eddins was with the Stone & Webster Service Corporation, at Boston.

An Actual Installation of the only Thermostatic-Instantaneous Gas Water Heater



This installation has been in operation for the past 8 years in the football clubhouse of the Orange High School, and has required no service. These 2—#3s replaced a 500 gallon tank and heat 300 gallons per hour (60 Rise). 10 to 20 boys take a shower at one time under 4 large showers. This type installation can be used for Baptistries, Launderettes, Dishwashers or any hook-up requiring a large quantity of hot water.

Other Models Available
All 60 Degree Rise.

#0— 40 G.P.H.	#2 90 G.P.H.
#1— 60 G.P.H.	#3—150 G.P.H.

Approved By I.G.A.
Gas Combustion Engineers

Manufactured By

Little Giant Water Heater Company

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GOODMAN
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"Z" HANDLE & LOCKING SLEEVE
GAS MAIN STOPPER

The Reliable Shut-Off for Street Mains

THE GOODMAN STOPPER

Now has the "Z" handle for easy manipulation. When locked in place it holds. Stopper cannot slip. Gas cannot pass. Adjusted in 30 seconds.

Ask for circulars on this and other distribution equipment.

Nearly a half century of service to the Gas Industry.

Safety Gas Main Stopper Co.
523 Atlantic Avenue, Brooklyn, New York

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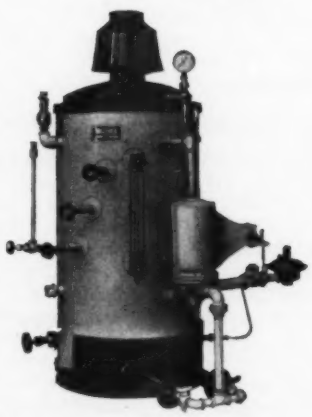
FOR SALE
Butane Air Plant
5000 C F H Output

Complete with 9' x33' and 10' x 50' storage tanks.
Littrell Construction Co.
Box 25, Brewton, Ala.

Metal Protection. Bulletin B34, issued by The Arco Company, 7301 Bessemer Ave., Cleveland, describes and illustrates the applications of Dum-Dum for protection of metal tanks and other structures. It is a thick, tough and elastic coating applied only by spray. Should not be applied over bituminous type coatings.

LATTNER GAS BOILERS
1 H.P. to 45 H.P.



2 H.P. Gas Fired Pressing machine boiler. 100 lbs. ASME Code.

P. M. LATTNER MFG. CO.
CEDAR RAPIDS, IOWA

Commercial Chemical Development Meeting March 10

According to Dr. L. B. Hitchcock, President of the Commercial Chemical Development Association, the many techniques which must be employed in developing a new product before it can be considered a regular article of commerce will be covered by authorities in their fields in an interesting all-day program to be held by the Commercial Chemical Development Association on March 10 at the Roosevelt Hotel in New York City. Addresses to be delivered will include:

Gearing Commercial Chemical Development to Sales; D. K. Ballman, Asst. Genl. Sales Mgr., Dow Chemical Company, Midland, Mich.

Gearing Commercial Chemical Development to Research; Dr. C. F. Rassweiler, Vice-Pres. for Research and Development, Johns-Manville Corporation, New York City.

Gearing Commercial Chemical Development to Manufacturing; John J. Healy, Jr., Asst. Genl. Mgr., Merrimac Division, Monsanto Chemical Company, Everett,

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NON-EXPLOSIVE .. NON-CORROSIVE NON-INFLAMMABLE

One 8 oz. can will treat a 1½" Service 40 feet long.

Nugent Named Bryant Heater Sales Promotion Manager

Frank J. Nugent, who since March, 1944, has been general manager of appliance sales for Rheem Manufacturing Company, has accepted the position of Sales Promotion Manager of Bryant Heater Company, Cleveland, Ohio. The announcement was made by J. N. Crawford, Vice President in Charge of Sales of Bryant Heater.

Frank J. Nugent

Mr. Nugent, who joined Bryant January 1st, is a recognized authority in the heating and water heating field. He is first vice president of the Gas Appliance Manufacturers' Association and chairman of the water heater section of that organization. He is also vice chairman of the electric water heater section of the National Electrical Manufacturers' Association.

Prior to joining Rheem in 1939, Mr. Nugent had been associated with Koppel Car and Equipment Manufacturing Company, the Blaw Knox Company and the Pittsburgh Water Heater Sales Company.

Jennings to Direct New Freedom Gas Program

Norval D. Jennings has been appointed Secretary of the New Freedom Gas Kitchen Program of the American Gas Association and is now in direct charge of that activity, it has been announced by H. Carl Wolf, Managing Director of the Association. He succeeds H. Vinton Potter who was recently named Coordinator of Promotion and who will integrate the New Freedom program with other national promotional activities of the Association. The New Freedom Gas Kitchen Committee continues to have supervision over this program.

Now in an advanced merchandising phase, the New Freedom Gas Kitchen Program is supported by the A.G.A. Promotion, Advertising and Research Fund with the participation of "CP" gas range manufacturers and Servel, Inc. Under the program many cooperating utilities throughout the country are certifying New Freedom Gas Kitchens installed by local builders.

Silex Appoints Lapham for Sales Mgr. Post

Douglas A. Lapham has been appointed sales manager of the restaurant equipment division of The Silex Company, Hartford 2, Conn.

Perfection Holds 60th Anniversary Meeting

Sales promotion and merchandising plans for 1948 were announced in January when sales representatives of Perfection Stove Company, Cleveland, Ohio, gathered from all over the United States for a 60th anniversary sales convention.

Highlights of the meeting included announcements of Perfection's entry into the gas appliance field with ranges and water heaters using natural, manufactured and liquefied petroleum gas soon to be available.

Starting in 1888 as a small foundry employing 30 workers, Perfection is now employing more than 100 times its original number of employees.

For the past 25 years, the company has been headed by L. S. Chadwick, well-known to the stove industry because of the many patents he has been granted covering cooking and heating devices.

CARL F. ASENDORF

Carl F. Asendorf, sixty-nine, Manager for American Meter Company's Chicago plant, died at St. Josephs Hospital, Chicago, January 7th. Mr. Asendorf was born October 18, 1878 in Baltimore, Md. He was one of the most beloved members of the manufacturing fraternity of the Gas Industry, a member of the Guild of Ancient Supplers, widely known with a host of friends.

Carl S. Asendorf

Mr. Asendorf started his career in the gas industry in 1895 with the Maryland Meter Works of Baltimore. He was associated with the American Meter Company first in Baltimore and since 1902 in Chicago. There he had full charge of Factory Operations since January 1, 1926.

He held membership in the old American Gas Light Association, American Gas Institute, Commercial Gas Association and American Gas Association. He was also a member of the Michigan, Indiana, Illinois, Wisconsin and Mid West Gas Association as well as a member of the Illinois Athletic Club and Chicago Association of Commerce.

DAVID N. LAMBERT

David N. Lambert, seventy-seven, president of the Lambert Meter Company, of Plainfield, now liquidated, died in Plainfield, New Jersey, on January 7th. Mr. Lambert was born in Russia and came to the United States when he was seventeen.

The Lambert Meter Company was established in Brooklyn, New York, in 1921, and was moved to Plainfield, New Jersey, in 1939. For 23 years Mr. Lambert had been associated with the American Meter Company, for 5 years with the Superior Meter Company.

David N. Lambert

In addition to meters and its associated apparatus, he invented an unusual flowmeter, many improvements to gas meters and gas apparatus, also an anaesthetometer, a resuscitator, and a large number of smaller hospital or medical apparatuses.

He enjoyed the good will of the leading gas men and was liked and respected by all those he came in contact with for his forthrightness, his intuitive appreciation of most problems and was generally considered an authority on tin gas meters.

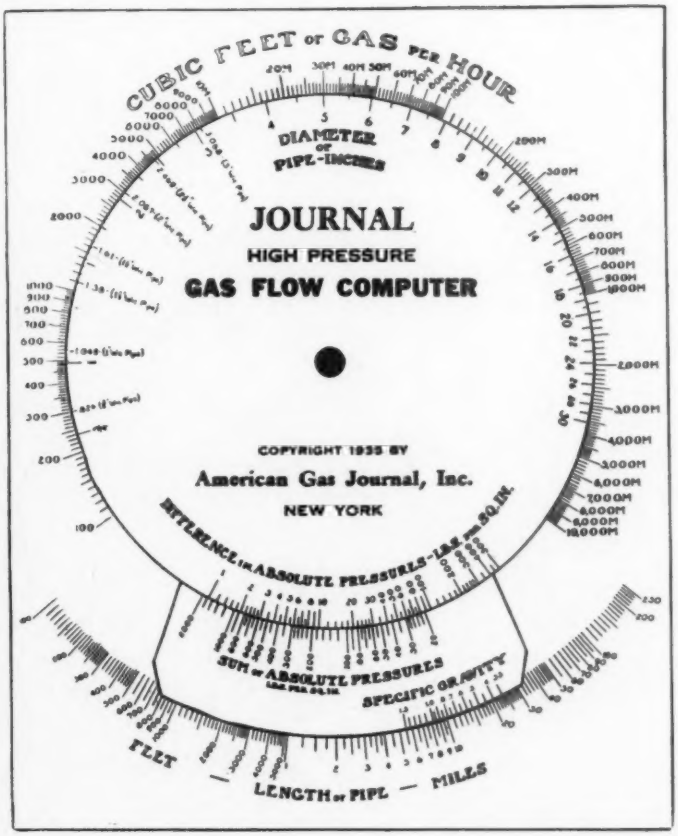
Surviving are his son, Noah D. Lambert, who was secretary-treasurer of the company for many years, and three married daughters.

JOHN L. VAIDEN

John L. Vaiden, fifty-four, distribution engineer for the Consolidated Edison Company of New York, Inc., died January 19th at his home in Westfield, New Jersey.

He was first employed by Consolidated Gas Company of New York in 1922 as an engineer's assistant. In 1923 he was loaned to the Bartlett-Hayward Company, returning to Consolidated Gas in 1925. His work soon became identified with that company's gas distribution system and continued along that line, through the Consolidated Edison mergers, until 1942, when he was appointed assistant manager of System Operation. This latter post acquainted him with the problems of the electric side of the company's operations and he was named distribution engineer in the Electrical Engineering Department in 1944.

"Journal" Gas Flow Computers



These Improved Gas Flow Computers are available in durable celluloid, encased in a convenient leatherette cover with complete instructions.

Actual Size 6¼ x 7½

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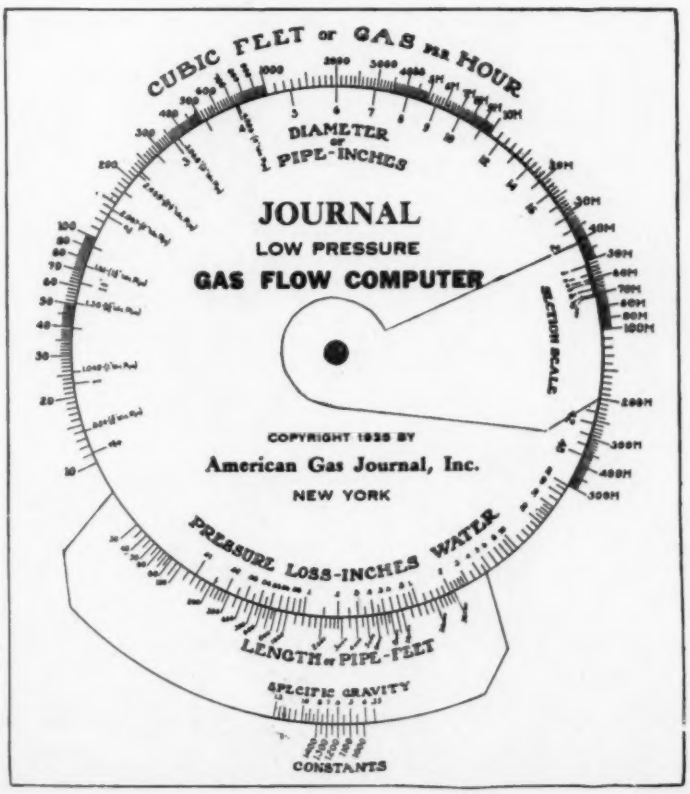
High Pressure Computer Range:

Cu. Ft. of Gas Per Hour—100-10,000 M
Diameter of Pipe Inches ¾-30
Difference in Absolute Pressure—Lbs. per sq. in. 1-500
Sum of Absolute Pressures—Lbs. per sq. in. 2000-20
Specific Gravity 1.5-.35
Length of Pipe—Feet 100-5000
Length of Pipe—Miles 1-250

Low Pressure Computer Range:

Cu. Ft. of Gas Per Hour—10 to 500 M
Pipe Diameter ¾" to 48" (including standard and actual weight up to 4")
Pressure Loss Inches .01-10.
Length of Pipe—Feet 30-30,000
Specific Gravity 1.5-.35
Constants 1400-1000

Price $4.00 Each, Postage Prepaid



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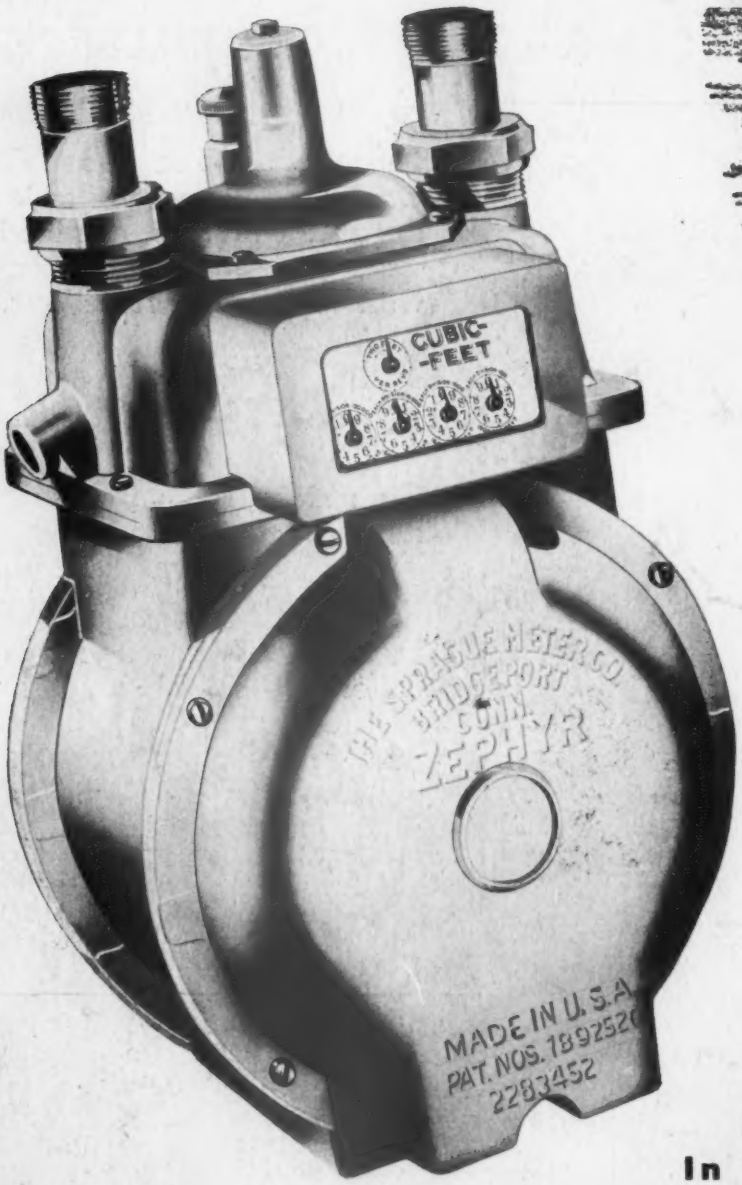

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